JEAN LAFITTE NATIONAL HISTORICAL PARK & PRESERVE
MARRERO, LOUISIANA

REPLACE JONES POINT TRAILER,
BARATARIA PRESERVE,
JELA
PMIS NO. 325249

JAMES H. CROFT, JR., AIA
5078
STATE OF LOUISIANA
REGISTERED ARCHITECT

PROJECT SPECIFICATIONS
FINAL
CONSTRUCTION DOCUMENTS

STATE OF LOUISIANA
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Specification Sections Prepared by PES Structural Engineers:
03 30 00 Cast-in-Place Concrete
05 12 00 Structural Steel Framing
05 40 00 Cold-Formed Steel Framing
06 10 00 Rough Carpentry
06 16 00 Wood Sheathing
31 62 19 Timber Piles
THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY JOHN O'BRIEN, P.E., S.E. ON THE DATE ADJACENT TO THE SEAL.
SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

NATIONAL PARK SERVICE

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END OF SECTION 00 01 10

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 GENERAL

1.1 SUMMARY

A. Section includes the following:

1. Work Covered by Contract Documents
2. Work Phases
3. Work Under Other Contracts
4. Government-Furnished Materials
5. Contractor Use of Site
6. Public Use of Site
7. Occupancy Requirements for Buildings
8. Conduct of Operations
9. Work Restrictions
10. Special Construction Requirements
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1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: Barataria Preserve (multiple sites) at Jean Lafitte National Historical Park and Preserve, Marrerro, Louisiana.

B. The Work consists of:

1. Interior Renovations to the Education Center - East and West sides (Area 1). Also includes replacement of exterior windows and replacement of existing chiller and chiller piping.
2. Interior Renovations to the Admin Building (former Visitor Center) including renovations to the Exhibit and office areas. Renovations of public restrooms to accommodate new storage space and lactation room. (Area 2)
3. Site work at Maintenance Complex and Admin Building (Former VC) parking areas including replacement of entry gate, fence replacement and repairs, new paving and re-paving, new canopy and minor modifications to Maintenance Complex Building (Area 3)
4. Site Work at Jones Point (Area 4). Work includes removal of Jones Point Trailer and all appurtenances to accommodate site reclamation. Site work includes demolition, utilities, grading, planting, and some fence work.

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

1.3 WORK PHASES

A. The Work shall be phased by location as necessary, in coordination with NPS. Work at the various locations may be performed sequentially or concurrently; however, the total project duration shall not exceed 490 calendar days. Work locations are listed below. The Contractor shall coordinate the final schedule and phasing plan with NPS prior to commencing.

1. Work. Education Center - Area 1
2. Admin Building (Former VC) - Area 2 and Maintenance Complex - Area 3

3. Jones Point - (Area 4)

1.4 WORK UNDER OTHER CONTRACTS

A. General: Cooperate with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract. Coordinate Work of this Contract with work performed under separate contracts.

B. Concurrent Work: Government will award separate contract(s) for the following construction operations at Project site. These operations will be conducted simultaneously with work under this Contract.

1. Trail Improvements at Barataria Preserve (PMIS NO. 318919): A separate contract will be awarded from January 2026 to March 2027.

1.5 GOVERNMENT-FURNISHED MATERIALS

A. In case of Government -furnished materials:

1. Government will arrange and pay for delivery of Government-furnished items according to Contractor's Construction Schedule.
2. Contractor is responsible for initial inspection, receiving, unloading, and handling Government-furnished items at Project site.
3. Government will inspect delivered items for damage after delivery. Contractor shall be present for and assist in Government's inspection.
4. Government will arrange for replacement if Government-furnished items are damaged, defective, or missing.
5. Contractor is responsible for protecting Government-furnished items from damage during storage and handling, including damage from exposure to the elements.
6. If Government-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
7. Contractor shall install and otherwise incorporate Government-furnished items into Work.

B. Government-Furnished Materials:

1. Appliances for the break areas including Refrigerators, Dishwashers, Microwaves, Washer and Dryer and all other owner provided furniture, fixtures and equipment not part of the permanently installed work. Government will pursue separate contracts to manage appliances/materials that are not considered permanently installed work.

1.6 CONTRACTOR USE OF SITE

A. General: Contractor shall have limited use of site for construction operations. Limit use of premises to areas within the Construction limits indicated on drawings. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limit site disturbance to within 10'0" of building except where scope of work extends beyond building perimeter.
2. Where site work or work on the exterior of the building is required, contractors shall avoid impacts with mature live oak trees (any diameter) and of all trees with diameters 10" or greater at Education Center site.
3. Refer to existing site survey for approximate location of mature trees.

4. At exterior work, provide "ground protection mats" over sensitive, vegetated soils to distribute weight of any construction equipment.
5. Do not disturb long-term monitoring infrastructure within the scope of work buffer zone need the Education Center, Admin Building (former VC), or the Jones Point Trailer Building and site. Contractor shall erect temporary polyethylene "safety orange" construction site safety fencing around these monitoring sites to identify and protect from any and all disturbance during the construction period. Refer to long-term monitoring locations where indicated in drawings.

B. Storage of Materials: Confine storage of materials to areas noted contractor staging noted in Site Logistics Plans.

C. Parking: Confine construction parking to areas noted in Site Logistics Plans.

D. Preservation of Natural Features:

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

E. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Government employees, and emergency vehicles at all times. Do not use for parking or storage of materials.

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.

F. Construction Camp: Establishment of a camp within park will not be permitted.

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

H. Bridge Restrictions: Identify jurisdictions, load restrictions, permit requirements, time and calendar restrictions as outlined.

1.7 PUBLIC USE OF SITE

A. Both Buildings will be closed to the public during construction.

1.8 OCCUPANCY REQUIRMENTS FOR BUILDINGS

A. Existing Buildings

1. Partial Government Occupancy: Government will occupy premises during entire construction period, with exception of areas under construction. Cooperate with Government during construction operations to minimize conflicts and facilitate Government usage. Perform Work so as not to interfere with Government's operations. Maintain existing exits, unless otherwise indicated.
    a. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Contracting Officer.

1.9 CONDUCT OF OPERATIONS

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

B. Work on Saturdays, Sundays, Federal holidays or at night may not be performed unless stated in the Work Restrictions below or without prior consent from the Contracting Officer. Submit requests 2 business/calendar days 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.

D. Contractor will provide their own padlock to link to parks padlock to open and close gates. The Park will not be responsible for opening and closing gates for contractor use.

1.10 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7:00 a.m. to 5:00 p.m., Monday through Friday, except when otherwise indicated.

1. Weekend Hours: N/A
2. Early Morning Hours: N/A
3. Hours for Core Drilling: N/A

B. Existing Utilities

1. Existing Utilities: Notify Contracting Officer and utility companies of proposed locations and times for excavation.
2. Contractor shall be responsible for locating and preventing damage to known utilities. If damage occurs, repair utility at no additional expense to the Government.
3. If damage occurs to an unknown utility, repair utility. An equitable adjustment will be made in accordance with the Changes clause of the contract.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Government or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Contracting Officer not less than two business days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Contracting Officer’s written permission.
3. Hours and length of Utility Shutdowns:

D. Nonsmoking Building/Tobacco Use/Vaping: Smoking is not permitted within buildings or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.11 SPECIAL CONSTRUCTION REQUIREMENTS

A. Project Website: A project website administered by NPS will be used for purposes of managing communication and documents during construction stage.

1. See Section 01 31 00 "Project Management and Coordination" for requirements on using Project Website.

1.12 SOILS INVESTIGATION REPORT

A. The report entitled "Geotechnical Exploration" dated 8/20/2024 , prepared by Eustis Engineering is available with this package.

B. In case of conflict between report and drawings or specifications, the drawings and specifications govern.

1.13 ADDITIONAL REPORTS

A. The report entitled "Hazardous Materials Assessment" dated 8/15/2024 prepared by CROFT & Associates, PC subconsultant TSE Environmental, LLC is an appendix with this package.

B. In case of conflict between report and drawings or specifications, drawings and specifications govern.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 11 00

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SECTION 01 26 01 - 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 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

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.

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. Consent of Surety:

1. When any contract is modified, the Contractor shall provide the consent of surety if-
   a. An additional bond is obtained from other than the original surety;
   b. No additional bond is required and
      1) The modifications are for new work beyond the scope of the original contract; or
      2) The modification does not change the contract scope but changes the contract price (upward or downward) by more than 25 percent or $50,000; or
   c. Consent of surety is required for a novation agreement.
2. When a contract for which performance or payment is secured by any of the types of security listed in FAR 28.204 is modified as described in paragraph (a) of this subsection, no consent of surety is required.
3. Agencies shall use Standard Form 1414, Consent of Surety, for all types of contracts.

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 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 insurance, 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.

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:
   a. Overhead……10%
   b. Profit…….....10%
2. 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.
3. 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.
4. 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.

5. At no time can profit be calculated on Overhead or itself, it must be calculated on direct costs of work only.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 26 01

SECTION 01 27 00 - DEFINITION OF CONTRACT LINE ITEMS

PART 1 GENERAL

1.1 SUMMARY

A. Section explains in general, what is and is not included in a contract line item, and limits or cut-off points where one item ends and another begins.

B. If no contract line item exists for a portion of work, include costs in a related item.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.1 LIST OF CONTRACT LINE ITEMS

A. Contract Line Item Number 1: Education Center (Area 1) - Renovation East + HVAC .

1. This item consists of Interior renovations to the plan east side of the Education Center and replacement of the building HVAC system with associated renovations to the west side of Education Center to support new HVAC system.
2. Measurement for payment will be based upon construction progress.
3. Payment will be made periodically based on progress against the contract lump sum price.

B. Contract Line Item Number 2 Administrative Building - Former VC (Area 2) - Renovation.

1. This item consists of Interior renovations with some exterior renovations to the Admin Building (former VC) as indicated in the drawings.
2. Measurement for payment will be based upon construction progress.
3. Payment will be made periodically based on progress against the contract lump sum price.

C. Contract Line Item Number 3 Maintenance Complex & Site (Area 3) .

1. This item consists of Miscellaneous site and building renovations to at the Maintenance Complex. Additional miscellaneous renovations to site entrance and gate and trail work between Maintenance Complex and Admin Building (Former VC) as indicated in plan.
2. Measurement for payment will be based upon construction progress.
3. Payment will be made periodically based on progress against the contract lump sum price.

D. Contract Line Item Number 4 Jones Point Site (Area 4).

1. This item consists of Demolition of Jones Point Trailer and miscellaneous site demolition at Jones Point (Area 4). Work includes miscellaneous removal of site features and fencing as indicated in plan. .
2. Measurement for payment will be based upon construction progress..
3. Payment will be made periodically based on progress against the contract lump sum price.

E. Options A, B, B2, C, D, E, F, G, and H.

1. Contract Line Item Number A (OPTION): Piling Repairs (Area 2 - DS22)
   a. This item consists of Repairs to damaged piling inside Admin Building (former VC).
   b. Measurement for payment: based upon construction progress.

c. Payment will be made periodically based on progress against the contract lump sum price.

2. Contract Line Item Number B (OPTION): Renovate Restrooms (Area 2 - DS22).
   a. This item consists of Renovations to the existing public restrooms to convert to a storage room and a lactation room (as indicated in drawings). .
   b. Measurement for payment: based upon construction progress.
   c. Payment will be made periodically based on progress against the contract lump sum price.
3. Contract Line Item Number B2 (OPTION): Hurricane Shutters at Admin (Area 2 - DS22) .
   a. This item consists of Addition of Manual Shutters to new windows on Admin Building (Former VC). .
   b. Measurement for payment: based upon construction progress.
   c. Payment will be made periodically based on progress against the contract lump sum price.
4. Contract Line Item Number C (OPTION): Extend paving/fencing (Area 3 – DS22).
   a. This item consists of Expand paving and modify fencing at existing Maintenance Complex. .
   b. Measurement for payment: based upon construction progress.
   c. Payment will be made periodically based on progress against the contract lump sum price.
5. Contract Line Item Number D (OPTION): Boat Parking Canopy (Area 3 – DS22) .
   a. This item consists of Construction of new cantilevered protective cover canopy in Maintenance Complex, including modifications to existing gate and fencing and rerouting of underground water line.
      1) Measurement for payment: based upon construction progress.
      2) Payment will be made periodically based on progress against the contract lump sum price.
6. Contract Line Item Number E (OPTION): Jones Point Site Reclamation (Area 4 – DS22) .
   a. This item consists of Reclamation of Jones Point Site including regrading of existing site.
      1) Measurement for payment: based upon construction progress.
      2) Payment will be made periodically based on progress against the contract lump sum price.
7. Contract Line Item Number F (OPTION): Repave Maintenance Complex Asphalt Surface (Area 3 – DS22).
   a. This item consists of repaving an area of pavement within the Maintenance complex. The area to be repaved is designated as Area 3.
   b. Measurement for payment: based upon construction progress.
   c. Payment will be made periodically based on progress against the contract lump sum price.
8. Contract Line Item Number G (OPTION): Transformer Upgrade (Area 3 – DS22) .
   a. This item consists of Replacement and upsizing of existing utility transformer.
   b. Measurement for payment: based upon construction progress.

c. Payment will be made periodically based on progress against the contract lump sum price.

9. Contract Line Item Number H (OPTION): Education Center Renovation West + Windows (Area 1 – ReRe).
   a. This item consists of Interior renovations to the plan west side of the Education Center and replacement of exterior windows as indicated in the drawings.
   b. Measurement for payment: based upon construction progress.
   c. Payment will be made periodically based on progress against the contract lump sum price.

END OF SECTION 01 27 00

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SECTION 01 31 00 - 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/DSC Project Website
7. Project Meetings
8. Environmental Coordination
9. Permits

B. Related Requirements:

1. Section 01 32 16 "Construction Schedule" for preparing and submitting 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 Owner's Commissioning Authority.

1.2 DEFINITIONS

A. Agency with Jurisdiction

B. Construction Permits – Contractor Provided

C. Government Furnished Permits

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 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 contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to:

1. Preparation of Contractor's 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

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 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 Section

3. Follow NPS DSC Electronic Drawing Standards. See CAD/BIM (Computer Aided Design/Building Information Modeling) & Drafting 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.
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 Contractor's responsibility. If Contracting Officer determines coordination drawings are not prepared in scope or detail, or are otherwise deficient, Contracting Officer will inform 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.
3. Contracting Officer will furnish 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 submittals required prior to mobilization:

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 or SF1413 for Contractor and all Subcontractors
8. Waste Management Plan
9. Quality Control Plan
10. Temporary Storm Water Pollution Prevention Plan (UPPP)
11. Indoor Air Quality (IAQ) Management Plan
12. Contractors Commissioning Plan
13. 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, and Contracting Officer will consider other contractual remedies.
    b. Work shall not commence until all the conditions below are met:
        1) Bonding Certificates and paperwork has been approved
        2) Certificates of Insurance have been approved
        3) Written Notice to Proceed has been issued. Written NTP will be issued 10 days after 1.4.E.1.b.1 and 1.4.E.1.b.2 are completed.
        4) SF1413 documents are received for Contractor and all Subcontractors.

1.5 REQUESTS FOR INFORMATION (RFI)

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 management and communication software.

1. Contracting Officer will not respond to RFIs submitted by other entities controlled by 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. Contractor's suggested resolution: If Contractor's suggested resolution impacts Contract Time or Contract Sum, 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 Contractor's means and methods.
    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 Architect'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 according to the 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. 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, the Contracting Officer will arrange an on-site meeting with Construction Contractor. Meeting agenda will include the following as a minimum:

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. Mobilization
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 Contractor.

1. Attendees: In addition to Government Representatives, each 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
    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. Sustainable design requirements
    i. Review of mockups
    j. Possible conflicts
    k. Compatibility requirements
    l. Time schedules

m. Weather limitations
n. Manufacturer's written instructions
o. Warranty requirements
p. Compatibility of materials
q. Acceptability of substrates
r. Temporary facilities and controls
s. Space and access limitations
t. Regulations of agency(ies) with jurisdiction
u. Testing and inspecting requirements
v. Installation procedures
w. Coordination with other work
x. Required performance results
y. Protection of adjacent work
z. 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. Contractor’s Environmental Manager: Designate on-site party responsible for overseeing 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 Contractor personnel in accordance with position requirements.
   g. Monitoring and documentation of environmental procedures.

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. Contractor's Environmental Training Program: 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 P2 training.
5. Compliance with environmental regulations: As specified in Regulatory Requirements. Submit Contractor 40 CFR (Code of Federal Regulations) employee training records upon request of Contracting Officer.

D. 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.

1.9 PERMITS

A. General:

1. Permits and Responsibilities: 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. Contractor shall also be responsible for damages to persons or property that occur as a result of 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, Contractor will not be considered an agent of the Government. Contractor shall comply with appropriate Federal, State and local laws.

B. Government Furnished Permits: During development of the project's design, permits listed below were negotiated and agreed to by the Government. Terms and provisions of these permits shall be adhered to for the duration specified in each permit.

C. Potential Permits: Permits listed below were identified during the design process as likely to be required based on typical means and methods of construction. The list is provided to assist Contractor in determining which permits will be required for contract's chosen means and methods. The list shall not be considered complete; it is the Contractors' responsibility to determine means and methods and obtain required permits. Contractor shall obtain all permits required to legally conduct work.

1. Construction trailer, Utilities hookup permit.
2. Stormwater Pollution Prevention Permit.

D. 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.

E. 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/DSC management software website when permits are obtained.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 31 00

SECTION 01 32 16 - 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 Contractor. It shall assist the Contractor and Contracting Officer (CO) in monitoring the progress of the work, evaluating proposed changes, and processing 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.

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 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/DSC management software website in native electronic file formats. 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.
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 that demonstrating how Contractor proposes to incorporate a modification, change, delay, or Contractor request.

1.4 QUALITY ASSURANCE

A. 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.
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. 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.

1.5 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate 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 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.

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 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 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.
        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. 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 14 days for startup and testing and commissioning activities.
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

C. Joint Review, Revision, and Acceptance:

1. Within seven calendar days of receiving Contractor's proposed Construction Baseline Schedule, Contracting Officer shall review initial Construction Baseline Schedule.
2. Within seven calendar days after review, Contractor shall revise and resubmit Construction Baseline Schedule in accordance with comments presented from review.
3. In the event the 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 Contractor or Contracting Officer, shall be corrected by 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 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. 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 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 Windows 11 and newer.

PART 3 EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

A. Progress Meeting Updates: Provide a 3 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: 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
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 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 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 Contractor shall submit, a revision to the Construction Schedule. Contractor may also request reasonable revisions to currently accepted Construction Schedule in event the Contractor's planning for the work is revised. If Contractor desires to make changes, 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, 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 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

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

1. Requirements: When contract modifications or changes are initiated, delays experienced, or Contractor desires to revise currently accepted Construction Schedule, Contractor shall submit to Contracting Officer a written time impact analysis illustrating the influence of modification, change, delay, or 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 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 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 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 01 32 16

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SECTION 01 32 33 - PHOTO DOCUMENTATION

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Existing condition images
2. Periodic construction images
3. Conditions following selective demolition.
4. Construction closeout images

B. See Section 01 77 00 "Closeout Procedures" for a complete listing of closeout documents.

C. See Section 01 79 00 "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of National Park Service (NPS) personnel.

1.2 SUBMITTALS

A. Selective Demolition and 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 Digital Video Disc (DVD) or a USB Flash Drive (thumb drive).

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.

PART 2 PRODUCTS

2.1 FORMAT REQUIREMENTS

A. Media: DVD-R Archival Gold or USB Flash Drive.

B. Media Labels: Archival DVD labeling markers, archival labels, or direct print.

C. Images: Provide sRGB (standard Red Green Blue) color images in JPEG (Joint Photographic Experts Group) format. Minimum sensor size of 12 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 commencement of any project work onsite, take color digital images of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.

1. Flag excavation areas before recording construction images.
2. Take sufficient separate images to show existing conditions adjacent to property before starting Work.
3. Take sufficient separate images of existing buildings either on or adjoining property to accurately record physical conditions at start of construction.
4. Photograph each building elevation to be worked on with as many photos as required to capture entire facade.
5. Take multiple representative photos of all elements to remain including character defining features as noted on architectural drawings.
6. Take one photo of each wall in every room to be worked in.

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.
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 01 32 33

SECTION 01 33 23 - 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 can 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.

B. 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.

C. 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.

D. Processing Time: Allow time for submittal review, including time for re-submittals, as follows. Time for review shall commence when e-mail notification is received by Contracting Officer (or designee) indicating submittal has been posted on NPS management software website and is

ready for review. When Contracting Officer has completed review, e-mail notification will be sent to Contractor indicating submittal has been processed. No extension of Contract Time will be authorized because of failure to transmit submittals in advance of Work to permit processing, including re-submittals.

1. Action Submittals
   a. Initial Review: Allow 30 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
   b. Re-submittal Review: Allow 20 days for review of each re-submittal.
2. Informational submittals
   a. Review: Allow 10 days for review of each submittal.

E. 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.
   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 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.

F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Transmittal Form (CM-16): All submittals shall be transmitted using National Park Service Transmittal Form (CM-16). The form can be downloaded from the DSC Workflows website's Submittal Review page and completed on the NPS/DSC management software website. No action will be taken on a submittal item unless accompanied by this Transmittal Form.
   a. Complete the general information at the top of form.
   b. Provide all required information based on submittal type
   c. Attach all related documents.
   d. Sign the Contractor section at bottom of the Transmittal Form (CM-16).
2. Physical samples: Complete Transmittal Form (CM-16) on the NPS/DSC management software website as described above. Deliver physical samples to the Contracting Officer

(or designee) on site for processing. All comments and actions will be documented on the Transmittal Form (CM-16) on the NPS/DSC management software website.

G. 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).

H. 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".

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

J. 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 CONTRACTOR'S USE OF CAD/BIM FILES

A. General: At Contractor's written request, copies of CAD (Computer Aided Design)/BIM (Building Information Modeling) files will be provided to Contractor for Contractor's use in connection with Project, subject to:

1. Files provided as-is; no format or other changes to files or changes to objects in the drawing will be done by the Government.

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:
   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/DSC management 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.
   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: Contractor is encouraged to submit products made out of recycled or environmentally responsible material. Every effort will be made by National Park Service 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 management software website.
    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 01 31 00 "Project Management and Coordination."

C. Contractors Construction Schedule: Comply with requirements specified in Section 01 32 16 "Construction Schedule."

D. Accident Prevention Plan: Comply with requirements specified in Section 01 35 23 "Safety Requirements."

E. Schedule of Values: Comply with requirements specified in Section 01 32 16 "Construction Schedule."

F. Waste Recycling Plan: Comply with requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."

G. Quality Control Plan: Comply with requirements specified in Section 01 40 00 "Quality Requirements."

H. Storm Water Pollution Prevention Plan: Comply with requirements specified in Section 01 57 23 "Temporary Storm Water Pollution Prevention" and storm water permit requirements identified in Section 01 31 00 "Project Management and Coordination."

I. Indoor Air Quality Management Plan: Comply with requirements specified in Section 01 57 19.11 "Indoor Air Quality Management."

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 specified information.

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.

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.

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 Contractor's approval.

1. Any work done or orders for materials or services placed before approval shall be at 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. Contractor shall address review comments when proceeding with the work.
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. 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 01 33 23

SECTION 01 35 13.22 - ARCHEOLOGICAL PROTECTION

PART 1 GENERAL

1.1 SUMMARY

A. Section consists of protecting archeological resources contained in soil deposits.

1.2 DEFINITIONS

A. Archeological Resources: Archeological resources are physical evidence of past human activity, including evidences of effects of that activity on the environment. Archeological resources represent both prehistoric and historic time periods, found above and below ground and under water.

B. Archeologically Sensitive Areas: Areas having potential to contain significant (National Register eligible) archeological resources. If National Register eligible or listed archeological resources could not be avoided, an appropriate mitigation strategy would be developed in consultation with state historic preservation officer and, if necessary, associated American Indian tribes.

C. Non-sensitive Areas: Areas with little potential of containing significant (National Register eligible) archeological resources.

D. Archeological Monitor: Representative of Government designated to oversee construction activities that could disturb archeological resources.

E. Archeological Resources Protection Act (ARPA) of 1979 (Public Law (P.L.) 96-95; 93 United States Statues at Large (Stat.) 712): defines archeological resources as any material remains of past human life or activities that are of archeological interest and at least 100 years old; Section 4 of the statute describes the requirements that must be met before Federal authorities can issue a permit to excavate or remove any archeological resource on Federal or Indian lands; the curatorial requirements of artifacts, and other materials excavated or removed.

1.3 SUBMITTALS

A. Daily Work Schedule: Detail construction work in archeologically sensitive areas. Submit to Contracting Officer (CO) 30 days before start of ground disturbing site work.

1.4 QUALITY ASSURANCE

A. At least one week before on-site work begins, Contractor shall meet with Contracting Officer and Archeological Monitor to discuss Daily Work Schedule, equipment, and special methods used in archeologically sensitive areas. Contractor shall ensure approved Daily Work Schedule is followed throughout construction.

PART 2 PRODUCTS

2.1 DAILY WORK SCHEDULE

A. Daily Work Schedule is required for work occurring within archeologically sensitive areas. Include all work that is to occur within the area and key the schedule to the drawings to include:

1. Starting and ending dates of ground-disturbing construction.

2. Locations of temporary facilities, such as barriers, field offices, staging areas, sanitary facilities, borrow pits, and haul and access roads.
3. Types of construction, such as clearing, topsoil stripping, structure or trench excavation, landscaping, and post construction clean-up.
4. Methods and equipment used for each type of construction.
5. Plan for relocating work in the event of temporary work stoppages at each archeologically sensitive area

PART 3 EXECUTION

3.1 BARRICADES

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

3.2 ARCHEOLOGICAL INVESTIGATION BY NON-NPS PERSONNEL

A. A permit is required for archeological investigations (e.g. excavation, shovel testing, coring, pedestrian survey, underwater archeology, rock art documentation, or other types of reconnaissance including archaeological monitoring of construction) carried out on parklands by non-National Park Service (NPS) personnel, unless carried out under a contract or a cooperative agreement specifically written for archeological investigations. Permits are issued under the Archaeological Resources Protection Act of 1979 (ARPA). The NPS does not issue a permit for archeological investigations carried out by NPS archeologists, or to archeologists working on NPS archeological projects under a contract or cooperative agreement.

B. Applicants should submit a Permit Application (DI Form 1926 (Revision September 2004) Office of Management and Budget (OMB) Number (No.) 1024-0037, approved through 1/31/2008. Permit Application form is available, in PDF (portable document file) format, to the manager of the park in which they propose to work; or to the regional director, with a copy to the park manager.

3.3 OBSERVATION

A. Archeological Monitor will observe ground-disturbing site work, including construction of temporary facilities, at archeologically sensitive areas, from a safe location mutually agreed on by Contractor and Monitor. As new ground is broken, Monitor will examine excavated materials, using construction layout centerline and perimeter staking as a reference point to record locations of findings.

3.4 DISCOVERY OF RESOURCES

A. If Archeological Monitor discovers resources, immediate relocation of work to a non-sensitive area may be required for Monitor to identify and document resources and, if necessary, develop appropriate mitigation plan. While Archeological Monitor is documenting resources in sensitive areas, Contractor shall relocate work to non-sensitive areas where monitoring is not normally required.

B. If resources are discovered while Archeological Monitor is absent, stop work immediately and report the discovery to the Contracting Officer.

3.5 WORK STOPPAGE

A. Contractor shall plan, schedule, and execute work to prevent stoppages at one area from stopping all work at construction site.

END OF SECTION 01 35 13.22

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SECTION 01 35 23 - 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 CONDITIONS PRESENT FOR PROJECT

A. Heat and Humidity

B. Biting Insects (including mosquitos)

C. Wildlife (Including Alligators and Poisonous Snakes)

D. Severe Weather

1.3 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.

B. Severe Weather Plan (SWP): After contract award and before the Pre-Construction conference, submit for review, a Severe Weather Plan. The Contracting Officer will review the proposed Plan. If the plan requires any revisions or corrections, the Contractor shall resubmit the Plan within 10 days. No progress payments will be made until the Plan is accepted.

1. This area is prone to hurricanes and severe weather. The contractor is responsible for taking appropriate precautions and meeting all OHSA and Park safety standards with regards to inclement weather. The Park will provide a severe weather protocol and evacuation procedure to the contractor prior to work beginning. Hurricane season is considered June 1st through November 30th with the peak months being mid-August to late October (September is peak month for hurricanes). The contractor is responsible for providing a hurricane plan that follows the park severe weather protocol and evacuation procedure while also addressing removing from or securing the project site to prevent items such as fencing, building materials, construction equipment, etc. from becoming airborne during a severe weather event.

1.4 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
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.

1.5 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.

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 SEVERE WEATHER PLAN (SWP)

A. The Plan shall be written to work with timelines for evacuation and securement of the Barataria Preserve provided by Jean Lafitte National Historical Park and Preserve.

2.3 FIRST AID FACILITIES

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

2.4 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 the 2024 International Fire Code Chapter 33.

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.

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 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.

END OF SECTION 01 35 23

SECTION 01 40 00 - 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. Mockups: Full-size physical assemblies constructed on-site. Mockups are constructed from selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Approved mockups establish the standard by which the Work will be judged, unless otherwise indicated.

1. Laboratory Mockups: Full-size physical assemblies constructed at a testing facility to verify performance characteristics.
2. Integrated Exterior Mockups: Mockups of exterior envelope erected separately from building but on Project site, consisting of multiple products, assemblies, and subassemblies.
3. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes, doors, windows, millwork, casework, specialties, furnishings and equipment, and lighting.

D. 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.

E. 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.

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

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

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

I. 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.
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, 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 shall be assigned no other duties.
2. Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
3. 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.

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.

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:

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.

G. Warranties: During the stated period, should any equipment or part of the project fail due to defects in material or workmanship, it shall be repaired or replaced by manufacturer at no cost to the Government.

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.

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 features of work.
3. Ensure copies of referenced standards related to sampling, testing, and execution for features 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 portions 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.

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 for the 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.

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

END OF SECTION 01 40 00

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, physical, and chemical processes taking place over 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. Renewable resources can be exhausted if improperly managed. However, a renewable resource can last indefinitely with proper stewardship. Examples include trees in forests, grass 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 as 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 as part of Contract Documents by reference.

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

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 the 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.	49 30 2601-3003

	www.din.de	
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

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
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

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

C. American Association of State Highway and Transportation Officials (AASHTO):
   1. M288 Geotextile Specification for Highway Applications
   2. MP009-06 Standard Specification for Compost for Erosion/Sediment Control (Filter Berms and Filter Socks)
   3. MP010-03 Standard Specification for Compost for Erosion/Sediment Control (Compost Blankets)

D. American Society for Testing and Materials International (ASTM):
   1. A478 Standard Specification for Chromium-Nickel Stainless Steel Weaving and Knitting Wire
   2. A580/A580M Standard Specification for Stainless Steel Wire

3. A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
4. B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube
5. C1240 Standard Specification for Silica Fume Used in Cementitious Mixtures
6. C128 Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate
7. C131 Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
8. C1319 Standard Specification for Concrete Grid Paving Units
9. C1338 Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
10. C136 Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates
11. C1371 Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers
12. C1386 Standard Specification for Precast Autoclaved AERATED Concrete (PAAC) Wall Construction Units
13. C1483 Standard Specification for Exterior Solar Radiation Control Coatings on Buildings
14. C1549 Standard Test Method for Determination of Solar Reflectance Near Ambient Temperature Using a Portable Solar Reflectometer
15. C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces
16. C289 Standard Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
17. C311 Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland-Cement Concrete
18. C33 Standard Specification for Concrete Aggregates
19. C593 Standard Specification for Fly Ash and Other Pozzolans for Use With Lime
20. C595 Standard Specification for Blended Hydraulic Cements
21. C618 Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
22. C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile
23. C739 Standard Specification for Cellulosic Fiber (Wood-Base) Loose-Fill Thermal Insulation
24. C936 Standard Specification for Interlocking Concrete Paver Units
25. C989 Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
26. D1435 Standard Practice for Outdoor Weathering of Plastics
27. 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))
28. D1972 Standard Practice for Generic Marking of Plastic Products
29. D198 Standard Test Methods of Static Tests of Lumber in Structural Sizes
30. D2103 Standard Specification for Polyethylene Film and Sheeting

31. D217 Standard Test Methods for Cone Penetration of Lubricating Grease
32. D2369 Standard Test Method for Volatile Content of Coatings
33. D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
34. D3786 Standard Test Method for Hydraulic Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
35. D3792 Standard Test Method for Water Content of Coatings by Direct Injection Into a Gas Chromatograph
36. D3864 Standard Guide for Continual On-Line Monitoring Systems for Water Analysis
37. D3960 Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings
38. D4017 Standard Test Method for Water in Paints and Paint Materials by Karl Fischer Method
39. D4263 Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method
40. D4444 Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters
41. D4491 Standard Test Methods for Water Permeability of Geotextiles by Permittivity
42. D4552 Standard Practice for Classifying Hot-Mix Recycling Agents
43. D4632 Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
44. D4716 Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head
45. D4833 Standard Test Method for Index Puncture Resistance of Geotextiles, Geomembranes, and Related Product
46. D4840 Standard Guide for Sampling Chain-of-Custody Procedures
47. D4887 Standard Test Method for Preparation of Viscosity Blends for Hot Recycled Bituminous Materials
48. D5106 Standard Specification for Steel Slag Aggregates for Bituminous Paving Mixtures
49. D5116 Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products
50. D5199 Standard Test Method for Measuring the Nominal Thickness of Geosynthetics
51. D5261 Standard Test Method for Measuring Mass per Unit Area of Geotextiles
52. D5268 Standard Specification for Topsoil Used for Landscaping Purposes
53. D5359 Standard Specification for Glass Cullet Recovered from Waste for Use in Manufacture of Glass Fiber
54. D5505 Standard Practice for Classifying Emulsified Recycling Agents
55. D5509 Standard Practice for Exposing Plastics to a Simulated Compost Environment
56. D5512 Standard Practice for Exposing Plastics to a Simulated Compost Environment Using an Externally Heated Reactor
57. D5539 Standard Specification for Seed Starter Mix
58. D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations
59. D5603 Standard Classification for Rubber Compounding Materials—Recycled Vulcanizate Particulate Rubber
60. D5663 Standard Guide for Validating Recycled Content in Packaging Paper and Paperboard

61. D5759 Standard Guide for Characterization of Coal Fly Ash and Clean Coal Combustion Fly Ash for Potential Uses
62. D5792 Standard Practice for Generation of Environmental Data Related to Waste Management Activities: Development of Data Quality Objectives
63. D5834 Standard Guide for Source Reduction Reuse, Recycling, and Disposal of Solid and Corrugated Fiberboard (Cardboard)
64. D5851 Standard Guide for Planning and Implementing a Water Monitoring Program
65. D5852 Standard Test Method for Erodibility Determination of Soil in the Field or in the Laboratory by the Jet Index Method
66. D6002 Standard Guide for Assessing the Composability of Environmentally Degradable Plastics
67. D6006 Standard Guide for Assessing Biodegradability of Hydraulic Fluid
68. D6007 Standard Test Method for Determining Formaldehyde Concentration in Air from Wood Products Using a Small Scale Chamber
69. D6046 Standard Classification of Hydraulic Fluids for Environmental Impact
70. D6081 Standard Practice for Aquatic Toxicity Testing of Lubricants: Sample Preparation and Results Interpretation
71. D6108 Standard Test Method for Compressive Properties of Plastic Lumber and Shapes
72. D6109 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastic Lumber
73. D6112 Standard Test Methods for Compressive and Flexural creep and Creep-Rupture of Plastic Lumber and Shapes
74. D6117 Standard Test Methods for Mechanical Fasteners In Plastic Lumber and Shapes
75. D6155 Standard Specification for Nontraditional Coarse Aggregates for Bituminous Paving Mixtures
76. D6245 Standard Guide for Using Indoor Carbon Dioxide Concentrations to Evaluate Indoor Air Quality and Ventilation
77. D6261 Standard Specification for Extruded and Compression Molded Basic Shapes Made from Thermoplastic Polyester (TPES)
78. D6262 Standard Specification for Extruded, Compression Molded, and Injection Molded Basic Shapes of Poly(aryl ether ketone) (PAEK)
79. D6270 Standard Practice for Use of Scrap Tires in Civil Engineering Applications
80. D6329 Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers
81. D6330 Standard Practice for Determination of Volatile Organic Compounds (Excluding Formaldehyde) Emissions from Wood-Based Panels Using Small Environmental Chambers Under Defined Test Conditions
82. D6345 Standard Guide for Selection of Methods for Active, Integrative Sampling of Volatile Organic Compounds in Air
83. D6400 Standard Specification for Compostable Plastics
84. D6435 Standard Test Method for Shear Properties of Plastic Lumber and Plastic Lumber Shapes
85. D6629 Standard Guide for Selection of Methods for Estimating Soil Loss by Erosion
86. D6662 Standard Specification for Polyolefin-Based Plastic Lumber Decking Boards

87. D6712 Standard Specification for Ultra-High-Molecular-Weight Polyethylene (UHMW-PE) Solid Plastic Shapes
88. D6886 Standard Test Method for Speciation of the Volatile Organic Compounds (VOCs) in Low VOC Content Waterborne Air-Dry Coatings by Gas Chromatography
89. D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures
90. D696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer
91. D698 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3))
92. D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair
93. E1021 Standard Test Methods for Measuring Spectral Response of Photovoltaic Cells
94. E1038 Standard Test Method for Determining Resistance of Photovoltaic Modules to Hail by Impact with Propelled Ice Balls
95. E1039 Standard Test Method for Calibration of Silicon Non-Concentrator Photovoltaic Primary Reference Cells Under Global Irradiation
96. E1040 Standard Specification for Physical Characteristics of Nonconcentrated Terrestrial Photovoltaic Reference Cells
97. 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
98. E1171 Standard Test Method for Photovoltaic Modules in Cyclic Temperature and Humidity Environments
99. E1333 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Under Defined Test Conditions Using a Large Chamber
100. E1362 Standard Test Method for Calibration of Non-Concentrator Photovoltaic Secondary Reference Cells
101. E1433 Standard Guide for Selection of Standards on Environmental Acoustics
102. E1462 Standard Test Methods for Insulation Integrity and Ground Path Continuity of Photovoltaic Modules
103. E1596 Standard Test Methods for Solar Radiation Weathering of Photovoltaic Modules
104. E1597 Standard Test Method for Saltwater Pressure Immersion and Temperature Testing of Photovoltaic Modules for Marine Environments
105. E1609 Standard Guide for Development and Implementation of a Pollution Prevention Program
106. E1686 Standard Guide for Selection of Environmental Noise Measurements and Criteria
107. E1690 Standard Test Method for Determination of Ethanol Extractives in Biomass
108. E1721 Standard Test Method for Determination of Acid-Insoluble Residue in Biomass
109. E1755 Standard Test Method for Ash in Biomass
110. E1758 Standard Test Method for Determination of Carbohydrates in Biomass by High Performance Liquid Chromatography
111. E1780 Standard Guide for Measuring Outdoor Sound Received from a Nearby Fixed Source

112. E1799 Standard Practice for Visual Inspections of Photovoltaic Modules
113. E1802 Standard Test Methods for Wet Insulation Integrity Testing of Photovoltaic Modules
114. E1821 Standard Test Method for Determination of Carbohydrates in Biomass by Gas Chromatography
115. E1827 Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door
116. E1830 Standard Test Methods for Determining Mechanical Integrity of Photovoltaic Modules
117. E1861 Standard Guide for Use of Coal Combustion By-Products in Structural Fills
118. E1918 Standard Test Method for Measuring Solar Reflectance of Horizontal and Low-Sloped Surfaces in the Field
119. E1971 Standard Guide for Stewardship for the Cleaning of Commercial and Institutional Buildings
120. E1980 Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces
121. E1991 Standard Guide for Environmental Life Cycle Assessment of Building Materials/Products
122. E2047 Standard Test Method for Wet Insulation Integrity Testing of Photovoltaic Arrays
123. E2114 Standard Terminology for Sustainability Relative to the Performance of Buildings
124. E2128 Standard Guide for Evaluating Water Leakage of Building Walls
125. E2129 Standard Practice for Data Collection for Sustainability Assessment of Building Products
126. E2397 Standard Practice for Determination of Dead Loads and Live Loads associated with Green Roof Systems
127. E2398 Standard Test Method for Water Capture and Media Retention of Geocomposite Drain Layers for Green Roof Systems
128. E2399 Standard Test Method for Maximum Media Density for Dead Load Analysis of Green Roof Systems
129. E2400 Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems
130. E241 Standard Guide for Limiting Water-Induced Damage to Buildings
131. E2432 Standard Guide for General Principles of Sustainability Relative to Buildings
132. E408 Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques
133. E413 Standard Classification for Rating Sound Insulation
134. E477 Standard Test Method for Measuring Acoustical and Airflow Performance of Duct Liner Materials and Prefabricated Silencers
135. E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
136. E683 Standard Practice for Installation and Service of Solar Space Heating Systems for One- and Two-Family Dwellings
137. E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization

138. E781 Standard Practice for Evaluating Absorptive Solar Receiver Materials When Exposed to Conditions Simulating Stagnation in Solar Collectors With Cover Plates
139. E782 Standard Practice for Exposure of Cover Materials for Solar Collectors to Natural Weathering Under Conditions Simulating Operational Mode
140. E823 Standard Practice for Nonoperational Exposure and Inspection of a Solar Collector
141. E881 Standard Practice for Exposure of Solar Collector Cover Materials to Natural Weathering Under Conditions Simulating Stagnation Mode
142. E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
143. E903 Standard Test Method for Solar Absorptance, Reflectance, and Transmittance of Materials Using Integrating Spheres
144. E948 Standard Test Method for Electrical Performance of Photovoltaic Cells Using Reference Cells Under Simulated Sunlight
145. F1869 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
146. F2034 Standard Specification for Sheet Linoleum Floor Covering
147. F2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes

E. Bat Conservation International:

1. Bat Approved Bat Houses

F. Carpet and Rug Institute

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

G. Center for Resource Solutions

1. Green-e program

H. Environmental Protection Agency (EPA):

1. Comprehensive Procurement Guidelines
2. ENERGY STAR
3. Environmentally Preferable Purchasing Program Final Guidance
4. GreenScapes program
5. Heat Island Initiative
6. Indoor Air Quality Building Education and Assessment Model (I-BEAM)
7. National Environmental Performance Track
8. Pollution Prevention (P2)
9. Product Stewardship Program
10. Significant New Alternatives Policy (SNAP) Program

I. Federal Trade Commission:

1. Guide for the Use of Environmental Marketing Claims

J. Forest Stewardship Council:

1. Chain-Of-Custody
2. Forest Management

K. Green Building Initiative (GBI):
   1. Green Globes - US

L. Green Seal:
   1. GC-03 Anti-Corrosive Paints
   2. GC-12 Occupancy Sensors
   3. GC-13 Split-Ductless Air-Source Heat Pumps
   4. GS-05 Compact Fluorescent Lamps
   5. GS-11 Paints
   6. GS-13 Windows
   7. GS-14 Window Films
   8. GS-31 Electric Chillers
   9. GS-32 Photovoltaic Modules
   10. GS-36 Commercial Adhesives
   11. GS-37 Industrial & Institutional Cleaners

M. International Iron and Steel Institute:
   1. CO2 Breakthrough Program

N. International Organization of Standardization:
   1. Guide 64; Guide for Inclusion of Environmental Aspects in Product Standards
   2. 9660 Information processing -- Volume and file structure of CD-ROM for information interchange
   3. 14001 Environmental management systems – Specification with guidance for use
   4. 14004 Environmental Management Systems – General Guidelines on Principles, Systems and Supporting Techniques
   5. 14020 Environmental labels and declarations – General principles
   6. 14024 Environmental labels and declarations – Type I environmental labelling - Principles and procedures
   7. 14040 Environmental management – Life cycle assessment – Principles and framework

O. National Association of Home Builders:
   1. Advanced Framing Techniques: Optimum Value Engineering

P. National Institute of Building Sciences:
   1. MOIST program for transfer of heat and moisture
   2. Whole Building Design Guide

Q. National Institute of Standards and Technology:
   1. BEES (Building for Environmental and Economic Sustainability) Lifecycle Decision Support Tool

R. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
   1. IAQ Guidelines for Occupied Buildings Under Construction

S. Southcoast Air Quality Management District:
   1. 1168 Adhesive And Sealant Applications

T. US Composting Council:

1. Seal of Testing Assurance Program

U. US Department of Agriculture:

1. Biobased Products – Definitions and Descriptions

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION (NOT USED)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Contracting Officer (CO), permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and openings are closed with permanent construction or substantial temporary closures.

1.3 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in Contract Sum as required.

B. Water Service: Potable Water from existing water system is not available for use. Provide connections to local water services as required for construction operations and include water costs and any additional permit costs in bid.

C. Electric Power Service: Electric power from existing system is not available for use. Provide connections to local electrical services as required for construction operations and include electricity costs and any additional permit costs in bid.

1.4 QUALITY ASSURANCE

A. Electric Service: Comply with National Electrical Contractors Association (NECA), National Electrical Manufacturers Association (NEMA), and Underwriter Laboratories (UL) standards and regulations for temporary electric service. Install service to comply with National Fire Protection Association (NFPA) 70.

B. Environmental Protection: Provide environmental protection as required by agency(ies) with jurisdiction and as indicated in Contract Documents. Coordinate with requirements of the following:

1. Regulatory Requirements
2. Indoor Air Quality (IAQ) Management
3. Noise and Acoustics Management
4. Environmental Management
5. Construction Waste Management

C. Accessible Temporary Egress: Comply with applicable provisions in the United States (U.S.) Architectural & Transportation Barriers Compliance Board’s Architectural Barriers Act Accessibility Standard (ABAAS) Accessibility Guidelines.

1.5 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before NPS acceptance, regardless of previously assigned responsibilities.

PART 2 PRODUCTS

2.1 MATERIALS

A. Temporary materials may be new or used, but must be adequate in capacity for required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Pavement: Comply with Division 32 Section - "Asphalt Paving."

C. Chain-Link Fencing: Minimum 2 inch (50 millimeters), 0.148 inch (3.76 millimeters) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 millimeter) high with galvanized steel pipe posts; minimum 2-3/8 inch (60 millimeters) OD (outside diameter) line posts and 2-7/8 inch (73 millimeters) OD corner and pull posts, with 1-5/8 inch (42 millimeters) OD top rails .

D. Portable Chain-Link Fencing: Minimum 2 inch (50 millimeters), 9-gage, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 millimeters) high with galvanized steel pipe posts; minimum 2-3/8 inch (60 millimeters) OD line posts and 2-7/8 inch (73 millimeters) OD corner and pull posts, with 1-5/8 inch (42 millimeters) OD top and bottom rails. Provide concrete bases for supporting posts.

E. Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.

F. Wood Enclosure Fence: Plywood, 6 feet (1.8 millimeters) high, framed with four 2 by 4 inch (50 by 100 millimeters) rails, with preservative-treated wood posts spaced not more than 8 feet (2.4 millimeters) apart.

G. Lumber and Plywood: Comply with requirements in Division 06 Section "Rough Carpentry ."

H. Gypsum Board: Minimum 1/2 inch (12.7 millimeters) thick by 48 inches (1219 millimeters) wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C 36/C 36M.

I. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

J. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10 mil (0.25-millimeter) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

K. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 millimeters).

L. Ground Protection Mats: Provide mats over sensitive vegetated soils to distribute weight of construction equipment. Mat material to be high-density polyethylene (HDPE) or premium composite polyurethane and shall have a load capacity of up to 60 - 120 tons per mat.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Contracting Officers Field Office: Field office shall be a separate structure from Contractor's office.

1. Prefabricated, job built, or a mobile unit; excellent condition, structurally sound, non-flammable exterior construction, weather tight, minimum 300 square feet.
2. Operable windows and security screens, adjustable ventilation.
3. Restroom (minimum of lavatory and toilet, with exhaust fan if room is windowless).
4. Air conditioner and heater.
5. Interior partition with lockable door to divide office
6. Paneling or freshly painted walls, acoustical tile or painted ceilings, and resilient flooring.
7. Two exterior doors with dead bolts keyed from outside,
8. Minimum 20-square-foot landing and steps at each exterior door.

C. Storage and Fabrication Sheds: Temporary weather tight sheds or other covered facilities for storage of materials subject to weather damage. Number and size of structures shall be subject to Contracting Officer's approval.

D. Toilets: Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, handicap accessible, sturdy enclosures with privacy locks.

1. Provide separate toilet facilities for men and women.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Heating, Ventilation, and Air Conditioning (HVAC) Equipment: Unless Contracting Officer authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to agency(ies) with jurisdiction, and marked for intended use.
3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with Minimum Efficiency Reporting Value (MERV) of 8 at each return air grille in system and remove at end of construction.

C. Direct Digital Control (DDC) Internet Connection: Furnish, install and maintain a high-speed connection (Digital Subscriber Line (DSL) or similar) between the project’s DDC system and the internet through a Contractor furnished internet service provider. Contractor is responsible for maintenance of this connection and costs associated with internet service provider through warranty period of this contract. Upon completion of warranty period, service shall be transferable to the Government at which time future costs for connection will no longer be the responsibility of Contractor.

D. Contracting Officers Field Office

1. Outlets: Minimum of two, quad outlets with surge protection.
2. Refrigerator: Under counter, 3.2-cubic-foot volume with 0.8-cubic-foot freezer with dedicated power receptacle.
3. Fire Extinguisher: UL listed and FM (Fire Pump Motors) approved, minimum rating of 2-A:10-B:C, dry chemical.

4. First-Aid Kit: General office/light industrial kit which includes antiseptic wipes, bandages, disposable gloves, tape, instant cold pack, dressing pads, eye pads, scissors, and acetaminophen tablets. Provide small size.
5. Two desks with five drawers each and two chairs with casters; two drafting tables (minimum 40 inches wide by 5 feet long) and two stools; drawing rack; two 2-drawer and one 4-drawer legal size locking filing cabinets with keys; 8 feet of 12 inch deep shelving; coat rack; two additional guest chairs; two desk lamps; two drafting table lamps; and a maximum/minimum thermometer.
6. Manufactured computer work station, capable of containing CPU (central processing unit), monitor, keyboard, printer; work station chair.
7. Additional tables necessary for FAX machine and copier.
8. Two 5-gallon trash cans and one 30-gallon trash can with lid.
9. Ceiling mounted general lighting fixtures.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance and as directed by the Contracting Officer.

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, NPS, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services. Acquire necessary permits.

B. Storm Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by the agency(ies) with jurisdiction.

C. Non-potable water for construction is not available within the park boundaries. Contractor shall furnish non-potable water from a source outside park boundary.

D. Potable water is not available on site. Furnish cool, potable water for construction personnel in locations convenient to work stations.

E. Sanitary Facilities: Provide temporary toilets, and wash facilities for use by construction personnel.

1. Place in approved locations secluded from public observation and convenient to work stations. Relocate as work progress requires.
2. Maintain and clean toilet facilities at least weekly.
3. Completely remove sanitary facilities on completion of work.

4. Toilets: Use of existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to NPS. At Substantial Completion, restore facilities to condition existing before initial use.

F. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

1. Use of permanent heating and cooling system will not be allowed without written authorization from Contracting Officer. When the permanent heating and cooling system is approved for use as temporary heating and cooling, pay costs until final acceptance. Permanent heating and cooling system shall be sufficiently complete, including controls, to permit safe operation
2. Provide and maintain adequate approved facilities, as required for safety and construction requirements, during the work. Provide ample clearance around stoves, heaters, chimney and vent connections to prevent ignition of combustible material
3. Install and maintain temporary filters when air handing equipment is used for temporary heating and cooling. Install new filters before final acceptance in addition to any extra sets of filters required. Clean coils as determined by Contracting Officer.
4. Warranties for equipment used for temporary heating and cooling shall start on date of Final Acceptance.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

H. Electric Power Service: Contractor is responsible to generate electrical power and distribution system of sufficient size, capacity, and power characteristics as required for construction operations. Temporary power from local power company is not available during construction.

I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

J. Telephone Service: No telephone service is available on site for Contractor's use. Make arrangements with Telephone Company and pay costs.

1. Make arrangements with the telephone company to install 2 lines for Contracting Officer’s use and pay installation costs.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 50 feet of building lines. Comply with NFPA 241.

2. Maintain support facilities until near Substantial Completion. Remove structures, equipment, and furnishings, and terminate services after punch list is 100 percent completed or when directed by Contracting Officer. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Contracting Officer.

B. Contracting Officers Field Office:

1. Provide Heat, lights, power, air conditioning, temporary water pressure and sewage holding tanks.
2. Provide office, furnishings, and utility connections no later than 7 days after date of Mobilization. Exact location will be determined by Contracting Officer.
3. Maintain equipment, furnishings, and structures. Provide equipment replacement elements as needed. Provide weekly cleaning services and trash disposal. Maintain and service water and sewer holding tanks as required.

C. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas as indicated on Drawings.

1. Provide dust-control treatment that is nonpolluting and non-tracking. Reapply treatment as required to minimize dust.

D. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

E. Traffic Controls: Erect and maintain barricades, lights, danger signals, and warning signs in accordance with Manual on Uniform Traffic Control Devices (MUTCD), Part IV, latest edition.

1. Protect existing site improvements to remain including curbs, pavement, and utilities.
2. Maintain access for fire-fighting equipment and access to fire hydrants.
3. Illuminate barricades and obstructions at night; keep safety lights burning from sunset to sunrise.
4. Adequately barricade and post open cuts in or adjacent to thoroughfares.
5. Protect pedestrian traffic by guardrails or fences.
6. When pedestrian traffic is detoured onto a roadway, provide temporary walkways with protection as required at ends and overhead. For walkways, use lumber running parallel to direction of traffic movement and provide ramps at changes of elevation.

7. Cover pipes, hoses, and power lines crossing sidewalks and walkways with troughs using beveled edge boards.
8. Install Barrier Tape where directed by Contracting Officer. Keep a minimum of two rolls on site.

F. Parking: Provide temporary parking areas for construction personnel.

G. Dewatering Facilities and Drains: Comply with requirements of the agency(ies) with jurisdiction. Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

H. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Fence, barricade, or otherwise block off the immediate work area to prevent unauthorized entry.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.
3. Erect and maintain sufficient detour signs at road closures and along detour routes.

I. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of agency(ies) with jurisdiction.

J. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

K. Temporary Elevator Use: Refer to Division 14 Sections for temporary use of new elevators.

L. Existing Elevator Use: Use of existing elevators will be permitted, as long as elevators are cleaned and maintained in a condition acceptable to Contracting Officer. At Substantial Completion, restore elevators to condition existing before initial use, including replacing worn cables, guide shoes, and similar items of limited life.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect elevator car and entrance doors and frame. If, despite such protection, elevators become damaged, engage elevator Installer to restore damaged work so no evidence remains of correction work. Return items that cannot be refinished in field to shop, make required repairs and refinish entire unit, or provide new units as required.

M. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.

N. Existing Stair Usage: Use of existing stairs will be permitted, as long as stairs are cleaned and maintained in a condition acceptable to Contracting Officer. At Substantial Completion, restore stairs to condition existing before initial use.

1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.

O. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

B. Cleaning of Equipment: Contractor shall ensure prior to moving on to Project Area, equipment, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Ensure equipment has been pressure washed and is free of exotic species. Equipment shall be considered free of soil, seeds, and other debris when visual inspection does not disclose such material. Disassembly of equipment components or specialized inspection tools are not required.

C. Temporary Erosion and Sedimentation Control: Refer to Section 01 57 23 "Temporary Storm Water Pollution Prevention".

D. Tree and Plant Protection: Refer to Section 01 11 00 "Summary of Work".

E. Pest Control: Follow NPS requirements to minimize attraction and harboring of rodents, roaches, and other pests and perform extermination and control procedures at regular intervals so Project will be free of pests and residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

F. Site Enclosure Fence: Before construction operations begin, furnish and install chain link fencing to prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Locate vehicular gates to avoid interference with traffic on public thoroughfares.
3. Locate pedestrian entrance gates as required to provide controlled personnel entry.
4. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Provide Contracting Officer with one set of keys.

G. Security Enclosure and Lockup: Install substantial temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

H. Barricades, Warning Signs, and Lights: Comply with requirements of Manual on Uniform Traffic Control Devices (MUTCD), part IV, 2003 edition for erecting structurally adequate barricades, including warning signs and lighting.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

J. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by NPS from fumes and noise.

1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant plywood on construction operations side.
2. Construct dustproof partitions with 2 layers of 3-mil (0.07-millimeters) polyethylene sheet on each side. Cover floor with 2 layers of 3-mil (0.07-millimeters) polyethylene sheet, extending sheets 18-inches (460 millimeters) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant plywood.
    a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48-inches (1219 millimeters) between doors. Maintain water-dampened foot mats in vestibule.
3. Insulate partitions to provide noise protection to occupied areas.
4. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
5. Protect air-handling equipment.
6. Weather strip openings.
7. Provide walk-off mats at each entrance through temporary partition.

K. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.

1. Responsible Person: Capable and qualified person shall be placed in charge of fire protection. Responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
2. Tobacco Use, Smoking, and Vaping: Smoking within buildings or temporary storage sheds is prohibited.
3. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of NPS. Check with Park; many require "burn permits" for welding.
4. Develop and supervise overall fire-prevention and -protection program for personnel at Project Site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
5. Provide temporary standpipes and hoses for fire protection. Hang hoses with warning sign stating hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.
6. Hazard Control: Take necessary precautions to prevent fire during construction. Do not store flammable or combustible liquids in historic structures. Provide adequate ventilation during use of volatile or noxious substances.
7. Spark Arresters: Equip gasoline or diesel powered equipment used during periods of potential fire hazards or in potential forest and grass fire locations with spark arresters approved by United States Department of Agriculture (USDA) Forest Service.
    a. Written determinations of periods and areas of potential fire hazard will be issued by Contracting Officer.
8. Buildings: Furnish a minimum of one extinguisher for each 1,500 square feet of area or major fraction thereof.
    a. Travel distance from any work station to nearest extinguisher shall not exceed 75 feet.
9. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment.

10. Service and Refueling Areas: Locate areas a minimum of 50 feet from buildings. Shut down equipment before refueling.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on 24-hour basis where required to achieve indicated results and avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. NPS reserves right to take possession of Project identification signs.
2. At Substantial Completion, clean and renovate permanent facilities used during construction period.

END OF SECTION 01 50 00

SECTION 01 57 19.11 - 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 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.
    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.

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%.

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. Inspect stored and installed absorptive materials regularly for dampness and mold growth. Inspect weekly.
    a. If stored or installed absorptive materials become wet, notify Contracting Officer. Inspect for damage. If acceptable to the Contracting Officer, dry completely prior to closing in assemblies; otherwise, remove (in accordance with the Waste Management Plan) and replace with new materials.
4. Basement: Monitor basement and crawlspace humidity and dehumidify when relative humidity is greater than 70 percent for more than 2 weeks or at first sign of mold growth.
5. Site drainage: Verify final grades of site work and landscaping drain surface water and ground water away from building.
6. Weatherproofing: Inspect moisture control materials as they are being installed. Include:
    a. Air barrier: Verify air barrier is installed without punctures and/or other damage. Verify air barrier is sealed completely.
    b. Flashing: Verify correct shingling of flashing for roof, walls, windows, doors, and other penetrations.
    c. Vapor Barrier: Verify vapor barrier is installed in accordance with Contract documents.
    d. Insulation layer: Verify insulation is installed without voids.
    e. Roofing: In accordance with ASTM D7186 Standard Practice for Quality Assurance Observation of Roof Construction and Repair.

7. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
8. 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 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.

1. Concrete: Moisture test prior to finish flooring application as specified in Division 9
    a. ASTM D4263 Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
    b. ASTM F1869 Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
    c. ASTM F2170 Test Method for Determining Relative Humidity in Concrete Floor Slabs Using In Situ Probes.
2. Wood: Moisture test as per ASTM D4444 - Standard Test Methods for Use and Calibration of Hand-Held Moisture Meters; unless otherwise indicated acceptable upper limits for wood products are less than 20% at center of piece; less than 15% at surface.

E. Testing for Moisture Penetration:

1. Windows: Test as per ASTM E1105 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; unless otherwise indicated, acceptable upper limits are no leakage for 15 minutes.
2. Horizontal Waterproofing (not roofing): Test as per ASTM D5957 Standard Guide for Flood Testing Horizontal Waterproofing Installations; acceptable upper limits are no leakage for 15 minutes.
3. Masonry: Test as per ASTM C1601 Standard Test Method for Field Determination of Water Penetration of Masonry Wall Surfaces; acceptable upper limits are no leakage for 15 minutes.
4. Exterior Walls:

a. Air tightness of the enclosure test: ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization or ASTM E1827 Standard Test Methods for Determining Air tightness of Buildings Using an Orifice Blower Door; acceptable upper limits are 0.25 CFM/sf or les at 50 Pascal's.
b. Water Leakage: Review as per ASTM E2128 Standard Guide for Evaluating Water Leakage of Building Walls.

END OF SECTION 01 57 19.11

SECTION 01 57 19.12 - NOISE AND ACOUSTICS MANAGEMENT

PART 1 GENERAL

1.1 SUMMARY

A. Section includes:

1. Special requirements for noise and acoustics management during deconstruction 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 A.M. to 9 P.M. 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 deconstruction operations to minimize noise. Perform noise-producing work in less sensitive hours of the day or week as directed by the Contracting Officer CO).

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 Generators Compressors	75 75 75	Saws Vibrators	75 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.
   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 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 hours 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 01 57 19.12

SECTION 01 57 23 - TEMPORARY STORM WATER POLLUTION PREVENTION

PART 1 GENERAL

1.1 SUMMARY

A. Federal Regulations for controlling discharges of pollutants (including chemicals, erodible material, and trash) from municipal separate storm sewer systems, construction sites, and industrial activities, were brought under the National Pollution Discharge Elimination System (NPDES) permit process by amendments to the Clean Water Act (CWA), and promulgation of federal stormwater regulations issued by the United States Environmental Protection Agency (USEPA). The USEPA uses amount of ground disturbance as a measure of a project potential to generate pollution from erosion. NPDES Phase I regulates discharges from construction sites that disturb 5 acres or more. NPDES Phase II regulations expand existing General Permit requirements under Phase I to include/regulated discharges from construction sites that disturb land equal to or greater than one (1) acre and less than 5 acres, known as Small Construction Activity. Construction disturbances 1 acre and above typically require a formal NPDES permit and a formal Stormwater Pollution Prevention Plan (SWPPP) must be submitted to Agency(ies) with Jurisdiction for review and approval.

B. National Park Service (NPS) Standards and Guidelines require water quality be protected to ensure compliance with Organic Act. Contractor shall prepare an Under-An-Acre Pollution Prevention Plan (UPPP) for each project resulting in less than 1 acre of soil disturbance or not otherwise subject to requirements of NPDES program. (UPPP Guideline)

C. The work of this section consists of implementing measures to prevent discharges of pollutants, including temporary storm water pollution during construction activities, either through compliance with NPDES permit program, or in conformance with NPS guidance for UPPPs.

D. Work of this section consists of implementing measures to Temporary Storm Water Pollution during construction activities, either through compliance with NPDES permit program; or in conformance with NPS guidance for UPPPs.

1.2 DEFINITIONS

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

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

C. National Pollution Discharge Elimination System (NPDES) Phase I: Regulates discharges from construction sites that disturb 5 acres or more.

D. NPDES Phase II: Regulations expand existing General Permit requirements under Phase I to include and regulate discharges from construction sites that disturb land equal to or greater than one (1) acre and less than 5 acres, known as Small Construction Activity.

E. UPPP: Developed and implemented pollution prevention plan (including stormwater management measures, if needed) to protect environment from pollutants on construction projects with less than one acre of disturbance in conformance with NPS guidelines.

1.3 SUBMITTALS

A. After contract award and before pre-construction conference, prepare and submit:

1. A UPPP in conformance with NPS guidelines and adherence to applicable construction storm water management practices.

B. Inspection Schedule: Submit schedule for inspection and monitoring of pollution prevention measures.

C. Inspection Schedule: Submit schedule for inspection and monitoring of storm water pollution prevention measures.

D. Erosion Control Products: Submit manufacturer's product information and installation recommendations for silt fence, filter fabric, erosion control blanket, straw bales, and other materials proposed for use on this project.

1.4 QUALITY ASSURANCE

A. Contractor shall prepare and submit a plan to Contracting Officer (CO) for review and concurrence.

B. Orientation Meeting: Contractor shall arrange and conduct an Erosion and Sediment Control meeting/briefing to inform parties, scheduled to be on-site during project, of measures to be implemented for proper erosion and sediment control (may be included as part of Pre-Construction Meeting).

1. Installation of silt fences, storm drain protection, and other forms of erosion and sediment control shall not begin until after this meeting has occurred.

C. Orientation Meeting: Contractor shall be responsible for arranging and conducting Pollution Prevention meeting/briefing to inform parties scheduled to be on-site during project of measures to be implemented for proper pollution prevention and control (may be included as part of Pre-Construction Meeting).

1. Installation of silt fences, storm drain protection, and other forms of pollution prevention controls shall not begin until after this meeting has occurred.

D. Pollution Prevention Manager: Contractor shall designate Pollution Prevention Manager who will be responsible for implementation, inspection, maintenance, and amendments to approved plan.

1. Pollution Prevention Manager shall be familiar with UPPP procedures and Best Management Practices (BMPs) and shall ensure emergency procedures and plan are updated as needed and available for inspection.
2. When changes in approved plan are required, Pollution Prevention Manager shall prepare and certify an amendment and submit to Contracting Officer for review and concurrence.

E. Pollution Prevention and Erosion Control Manager: Contractor shall designate Pollution Prevention and Erosion Control Manager responsible for implementation, inspection, maintenance, and amendments to approved plan.

1. Pollution Prevention and Erosion Control Manager shall be familiar with temporary storm water pollution prevention procedures and Best Management Practices and ensure emergency procedures and plan are updated as needed and available for inspection.

2. When changes in approved plan are required, Pollution Prevention and Erosion Control Manager shall prepare and certify an amendment and submit to Contracting Officer for review and concurrence.

PART 2 PRODUCTS

2.1 TEMPORARY STORM WATER POLLUTION PREVENTION PLAN

A. Provide UPPP which conforms to NPS requirements (utilize UPPP template) and include:

1. Responsible Parties
2. General Information: Project Scope, Project Details, Site Information, and Spill Prevention
3. Standards and Constraints
4. Project Scheduling
5. Known Data on Soil and Fill
6. Activities with Potential to Generate Sediment
7. Activities and Materials with Potential to Pollute Storm Water
8. Management and Reporting BMPs
9. Waste Management BMPs
10. Non-Storm Water Pollution Control BMPs
11. Soil Stabilization BMPs
12. Sediment Control BMPs
13. Other Pollution Control BMPs
14. References
15. Preparer's Certification
16. Appendices: Contact Information, Pollution Prevention Control Map or Sheet(s), Standard Installation Specifications for each BMP, and Blank forms.

PART 3 EXECUTION

3.1 ENVIRONMENTAL PROTECTION

A. Protection of Natural Resources: Comply with applicable regulations and these specifications. Preserve natural resources within project boundaries and outside limits of work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by Contracting Officer.

B. Construction Zone: Arrange construction activities to minimize pollution (i.e., erosion, trash, etc.) to maximum practical extent.

1. Clearing, excavation, and grading shall be limited to those areas of project site necessary for construction. Minimize area exposed and unprotected.
2. Clearly mark and delineate limits of work activities.
3. Equipment shall not be allowed to operate outside limits of work or to disturb existing vegetation.
4. Excavation and grading shall be completed during dry season to maximum extent possible.
5. Material shall be stored away from locations where water is present to greatest extent practicable.

3.2 REGULATORY REQUIREMENTS

A. Contracting Officer Notification: Contractor shall notify Contracting Officer in writing and by telephone of these events:

1. Erosion and sediment control meeting/briefing.
2. Following installation of required sediment control structures.
3. Prior to removal of or modification to sediment control structures.
4. Prior to removal of sediment control structures.

3.3 TEMPORARY STORM WATER POLLUTION PREVENTION PLAN

A. Review and Acceptance: Contractor and Contracting Officer will jointly review draft Plan and agree to needed revisions. Contractor shall incorporate revisions, sign, and submit final Plan to Contracting Officer. Final Plan will be the document enforced on the project.

1. Accepted Plan will describe and ensure implementation of practices to be used to reduce pollutants in storm water discharges.
2. Contractor shall maintain current copy of Plan and associated records and forms at jobsite throughout duration of project.
3. Plan shall be available for public inspection and inspection and use of Contracting Officer.
4. Approval of Contractor's Plan will not relieve Contractor of responsibility for compliance with applicable environmental regulations.

B. Implementation: Implement Plan as required throughout construction period and maintain erosion control elements in proper working order.

1. Do not perform clearing and grubbing or earthwork until Plan has been implemented.

3.4 SITE INSPECTIONS AND PLAN REVISIONS

A. Inspections: Contractor and Contracting Officer will perform a weekly inspection onsite.

1. Inspection shall include disturbed areas not completely stabilized, areas used for storage of materials, locations where vehicles enter or exit site, and other erosion and sediment controls included in the Plan.
2. Inspections shall be documented.
3. Inspection forms shall be retained onsite in Plan notebook throughout construction period.

B. Plan Revisions: It may be necessary to revise Plan during construction to make necessary improvements, revisions, or to respond to unforeseen conditions noted during construction or site inspections.

1. Plan shall specify mechanism whereby revisions may be proposed by Contractor or Contracting Officer.
2. Contractor and Contracting Officer will jointly review each revision to Plan before changes incorporated and implemented. Contractor will then provide revised copy of Plan to Contracting Officer.
3. Accepted modifications will be implemented within 7 calendar days following date of inspection when deficiencies or necessary corrections are first noted.

C. Negligence: Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to Government.

3.5 HOUSEKEEPING AND SITE MANAGEMENT

A. Store materials onsite in conformance to Federal, state, local, and manufacturer's regulations and specifications. Use Best Management Practices to minimize risk of materials coming into contact with environmental conditions (i.e. water and wind) that could disperse them.

B. Manage solid waste in conformance to Federal, state, and local regulations. Best Management Practices should be used to minimize risk of materials coming into contact with environmental conditions (i.e. water and wind) that could disperse them.

C. Manage hazardous waste (including contaminated soil) in conformance to Federal, state, local and NPS regulations and guidelines.

3.6 EROSION CONTROL MEASURES

A. Erosion control measures shall consist of Best Management Practices for storm water discharges, including silt fencing, barrier protectors, straw bales, temporary soil retention blankets, excelsior drainage filters, sediment traps and berms.

B. Berms and excelsior drainage filters shall be used to form sediment traps and control run-on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and staging areas.

C. Erosion control measures shall be used to contain only direct precipitation in construction zone. Contained water shall be allowed to percolate into ground or drain slowly through drainage filter sediment traps.

D. Earthen sediment traps or holding ponds shall not be used unless accepted by Contracting Officer.

E. Reduce runoff velocity and direct surface runoff around and away from fuel containment, storage, and borrow areas.

F. Divert surface runoff around and away from cut and fill slopes.

G. Place drainage filters around catch basins to create sediment traps to control run-off from construction area.

H. Excess water used for dust control shall be contained within demolition areas by erosion control measures.

I. Contractor shall prevent deposition of materials onto paved areas. Contractor shall inspect paved areas for deposited materials weekly and remove materials immediately.

J. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion as described in approved UPPP.

K. Before work begins, sufficient equipment shall be available on site to assure operation and adequacy of erosion control system can be maintained.

3.7 MAINTENANCE OF TEMPORARY FACILITIES

A. Ensure erosion and sediment control structures remain effective throughout excavation and grading operations. Relocate structures as necessary.

B. Inspect control structures after each significant rainfall. Promptly repair breaches which occur.

C. Contractor shall remove entrapped sediment from behind excelsior drainage filter after each storm.

3.8 REPORTING

A. If a discharge occurs or if project receives written notice or order from regulatory agency, Contractor shall immediately notify Contracting Officer and shall file written report to Agency(ies) with Jurisdiction within 7 days of discharge event, notice, or order. Corrective measures shall be implemented immediately following discharge, notice, or order. The report to the Agency(ies) with Jurisdiction shall contain:

1. Date, time, location, nature of operation, and type of discharge, including cause or nature of notice or order.
2. Best Management Practices deployed before discharge event, or prior to receiving notice or order.
3. Date of deployment and type of Best Management Practices deployed after discharge event, or after receiving notice or order, including additional Best Management Practices installed or planned to reduce or prevent re-occurrence.
4. An implementation and maintenance schedule for affected Best Management Practices.

3.9 SEDIMENT DISPOSAL

A. Sediment excavated from temporary sediment control structures shall be disposed on site with general fill, or with topsoil. Sediment shall be allowed to dry out as required before reuse.

B. Contractor shall place sediment removed from traps and other structures where it will not enter a storm drain or watercourse and where it will not immediately reenter the basin.

3.10 REMOVAL OF TEMPORARY STORM WATER POLLUTION CONTROL MEASURES

A. Temporary control measures shall be removed with permission of Contracting Officer within 20 working days after final acceptance of project, and/or once grading is complete and slopes have stabilized.

END OF SECTION 01 57 23

SECTION 01 67 00 - 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.

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. Masonry
   b. Finish Carpentry
   c. Plastic Fabrications
   d. Building Insulation
   e. Roofing
   f. Joint Sealers
   g. Wood & Plastic Doors
   h. Windows
   i. Skylights
   j. Glazed Curtain Wall
   k. Gypsum Board
   l. Tile
   m. Acoustical Ceilings
   n. Resilient Flooring
   o. Carpet
   p. Wall Coverings
   q. Paints & Coatings
   r. Toilet Compartments
   s. Loading Dock Equipment
   t. Office Equipment
   u. Furnishings & Accessories
   v. Renewable Energy Equipment
   w. Elevators
   x. Plumbing fixtures and equipment.
   y. HVAC equipment
   z. Lighting equipment
3. Material Safety Data Sheets (MSDS): For each product required by OSHA to have a MSDS, submit an MSDS. MSDS shall be prepared no earlier than June 1998. 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. Provide written description of the process used in evaluating chemical hazards relative to preparation of the MSDS.
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

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.

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 5 percent post-consumer recycled content and minimum 5 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 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 Owner.
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 Owner.

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.
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 Architect'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.
    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 01 67 00

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SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 GENERAL

1.1 SUMMARY

A. Section includes procedural requirements for cutting and patching on buildings that do not contain Historic Fabric.

1.2 SUBMITTALS

A. Cutting and Patching Plan: Submit Plan describing procedures at least 10 days before cutting and patching will be performed, requesting approval to proceed. Include:

1. Extent: Describe cutting and patching, show how performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure. Do not cut and patch structural elements in a manner that could change their load carrying capacity or increase deflection.
7. Contracting Officer’s (CO) Approval: Obtain approval of cutting and patching plan before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.3 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.

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.

D. 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 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.

1.4 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 PRODUCTS

2.1 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 will match the visual and functional performance of in-place materials when installed.

PART 3 EXECUTION

3.1 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.

3.2 PREPARATION

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

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.

D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

3.3 PERFORMANCE

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

1. Cut in-place construction to provide for installation of other components or performance of other construction subsequently. Patch as required to restore surfaces to 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 and 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 exposed or finished side into concealed surfaces.
3. Concrete: Cut using 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.
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 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 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.
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 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.
4. Ceilings: Patch, repair, or re-hang 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 weather tight condition.

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

END OF SECTION 01 73 29

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SECTION 01 73 40 - 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. Certificates: Submit certificate signed by land surveyor certifying location and elevation of improvements comply with requirements.

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

C. Certified Surveys: Submit two copies signed by land surveyor.

D. Quantity Surveys: Submit two copies showing quantities of work performed and actual construction completed in place.

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: Professional [land surveyor] [professional engineer] legally qualified to practice in jurisdiction where Project is located and is experienced in providing land-surveying services of kind indicated.

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.

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 Entergy to coordinate Electrical service requirements. Call main line and provide the meter number. Meter number is AM12163095 (AM121630952167643). Website: https://www.entergy-louisiana.com/.
   a. Construction Contractor Responsibilities: Contractor is responsible for coordinating all work outside building with utility.
2. Water Service Contact: Contact Jefferson Parrish: 504.736-6000 to coordinate Water service requirements. Website: https://www.jeffparish.net/departments/water-department.
   a. Construction Contractor Responsibilities: Contractor is responsible for coordinating all work outside building with utility.
3. Wastewater Service Contact: Contact Jorge Menendez (JELA Chief of Facilities): 504.382.4941 NPS JELA Barataria Preserve. to coordinate Wastewater service requirements.
   a. Construction Contractor Responsibilities: Contractor is responsible for coordinating all work outside of building with Park Facility Management.
4. Telephone Service Contact: Contact AT&T and NPS JELA IT Manager (Contact: Chad Neyland: 504.512.2500) to coordinate Telephone service requirements.
   a. Construction Contractor Responsibilities: Contractor is responsible for coordinating all work outside building with utility.

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 01 31 00 "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 land surveyor to lay out Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story 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.
6. Close site surveys with an error closure equal to or less than the established standard.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. 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).

3.5 FIELD ENGINEERING

A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning Work. Preserve and protect permanent benchmarks and control points during construction operations. Controls destroyed by Contractor will be replaced by Contractor at their expense.

1. Existing Monuments: All benchmarks, land corners, and triangulation points, established by other surveys, existing within construction area shall be preserved. If existing monuments interfere with Work, secure written permission before removing them.

B. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with NPS requirements for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

3.6 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 more than 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.

J. Quantity surveys: Shall be conducted, and data derived from these surveys shall be used in computing quantities of work performed and actual construction completed and in place.

1. Contractor shall conduct original and final surveys and surveys for any periods for which progress payments are requested. These surveys shall be conducted under direction of a representative of the Contracting Officer, unless Contracting Officer waives requirement in a specific instance. Government shall make such computations as are necessary to determine quantities of work performed or finally in place. Contractor shall make computations based on surveys for any periods for which progress payments are requested.
2. Promptly upon completing a survey, Contractor shall furnish originals of field notes and other records relating to survey or layout of Work to Contracting Officer. Contractor shall retain copies of all such material furnished to Contracting Officer.

3.7 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.
   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.
         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.

3.8 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.

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."

3.9 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.

3.10 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 01 73 40

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SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for:

1. Salvaging nonhazardous demolition waste.
2. Recycling non-hazardous demolition waste.
3. Disposing of nonhazardous demolition 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.

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.

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, 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. Land clearing debris (chipped debris can be used on site for mulch or erosion control)
2. Clean dimensional wood, palettes
3. Plywood, OSB (oriented strand board), and particle board
4. Concrete (can be ground and used for fill on site)
5. Asphaltic concrete (can be ground and used for fill on site)
6. Cardboard, paper, packaging, newsprint
7. Metals (from banding, stud trim, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
8. Gypsum drywall - unpainted
9. Non-hazardous paint and paint cans
10. Beverage containers: Aluminum, glass, and plastic containers
11. Insulation
12. Ceiling grid and tiles
13. Ductwork
14. Wiring
15. 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.

E. Salvage/Recycle Requirements: Government goal is to salvage and recycle as much nonhazardous demolition waste as possible including the following materials:

F. Salvage/Recycle Requirements: Government goal is to salvage and recycle as much nonhazardous demolition waste as possible.

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. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

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

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

F. 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.

G. 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.

H. Qualification Data: For Waste Management Coordinator.

I. 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.

J. 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.

K. 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, 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.
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 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. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume but use same units of measure throughout waste management plan.

B. Waste Identification: Indicate anticipated types and quantities of demolition waste generated by the Work. Include estimated quantities and assumptions for estimates.

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.

D. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include:

1. Landfill tip fees per ton.
2. If diverted, tip fee savings from landfill diversion.
3. Costs of recycling, salvage, or reuse.
4. Revenue from recycling, salvage, or reuse.
5. Total cost or savings from diversion. (Calculate by using tip fee savings and subtracting costs of recycling or adding revenue from recycling.)

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. Waste Management Coordinator: Engage waste management coordinator responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at Project site full time for duration of Project.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

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: Permitted on Project site.

C. Salvaged Items for Governments Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Allow for inspection if necessary.
4. Store items in secure area until delivery to Government.
5. Transport items to storage area on-site.
6. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION WASTE, GENERAL

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

B. Recycling Receivers and Processors: List below is provided for information only; available recycling receivers and processors include:

1. Jefferson Parish Marrero Drop-Off Site: (504)731-4612 | 6440 Lapalco Boulevard, Marrero, LA 70072

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

D. 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.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2 inch (38 millimeter) size.

B. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

1. Crush asphaltic concrete paving and screen to comply with requirements in Division 31 Section "Earth Moving".

C. Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

1. Pulverize concrete to maximum 1-1/2 inch (38 millimeter) size.

D. Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

1. Pulverize masonry to maximum 3/4 inch (19 millimeter) size.
2. Clean and stack undamaged, whole masonry units on wood pallets.

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

F. 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.

G. Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples, and accessories.

H. 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.

I. Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in dry location.

1. Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

J. Carpet and Pad : Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.

1. Store clean, dry carpet and pad in closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

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

L. Plumbing Fixtures: Separate by type and size.

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

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

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

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

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

3.5 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.

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.

3.6 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 01 74 19

SECTION 01 77 00 - 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. Where changes result from RFIs, RFPs, and/or Modifications indicate corresponding RFI/RFP/Modification number.

B. Keep record drawings current. Make record drawings available to Contracting Officer (CO) for inspection at the time of monthly progress payment requests. Upload current record drawings to the NPS/DSC project management software system as PDFs. 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:

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), DVD-R (digital video disc-recordable), or USB Flash Drive (Thumb Drive) with index and descriptions, and similar final record information.
4. Environmental Record Documents: As follows:
   a. IAQ Management Plan: As specified in Section 01 57 19.11 Indoor Air Quality (IAQ) Management.

b. Product Data for filtration media: As specified in Section 01 57 19.11 Indoor Air Quality (IAQ) Management.
c. Moisture Control inspections and reports: As specified in Section 01 57 19.11 Indoor Air Quality (IAQ) Management.
d. Material Safety Data Sheet (MSDS) Data: As specified in Section 01 57 19.11 Indoor Air Quality (IAQ) Management and Section Environmental Requirements for Products.
e. Affirmative Procurement Reporting Form: As specified in Section 01 67 00 Environmental Requirements for Products.
f. Environmental Product Data: As specified in Section [01 67 00] Environmental Requirements for Products.
g. Life-Cycle Assessment (LCA) Data: As specified in Section 01 67 00 - Environmental Requirements for Products.
h. Final Summary of Solid Waste Disposal and Diversion: As specified in Section 01 74 19 Construction Waste Management.
i. Commissioning Report: As specified in Section 01 91 14 Commissioning.

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.
9. Approved pre-functional checklists and functional performance testing reports from commissioning documentation.
   a. Equipment start-up requires coordination with commissioning process. Refer to Section 01 91 14 Equipment shall not be "temporarily" started for commissioning.
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. Submit demonstration and training videos.

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 of Section 01 91 14, 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.

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. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11 inch (215 by 280 millimeters) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product and name, address, and telephone number of Installer.

3. Identify each binder on front and spine with typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. 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.

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, yard, and grounds, 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.
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 01 74 19 "Construction Waste Management and Disposal."

END OF SECTION 01 77 00

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SECTION 01 78 23 - 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.

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 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 15 days of receipt of Contracting Officers' comments.

1.3 QUALITY ASSURANCE

A. Coordinate with Section 01 91 14 "Total Building Commissioning." Commissioning Agent shall review Operation and Maintenance Manuals for commissioned systems.

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 Contractor’s 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.

1. Binders: White, commercial quality, hard back, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2 by 11 inch (215 by 280 millimeter) paper; with clear plastic window sleeve on front and spine to hold label describing contents and pockets inside covers to hold folded oversize sheets.
    a. Cover Sheet: Identify binders on front and spine, with project title, location, park, contract number, prime contractor's name and address, date of substantial completion, and binder volume number. Insert cover sheet into clear plastic view pocket on front of binder. Insert sheet into clear plastic view pocket on spine with title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Data: Fill binders to no more than 75 percent of capacity. Punch holes shall not obscure any data. When contents of a single tabbed section cover more than one item, provide colored paper sheets to separate the data for each item.
    a. Manufacturers' Data: Provide originals for color or copyrighted data. Black and white data may be original or clean, good quality reproductions. No copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps. Include only sheets that apply to items installed; cross out inapplicable data.
    b. Vendor Furnished As-Built Drawings: Maximum 24 inch by 36 inch sheets with minimum character or lettering size of 1/8 inch. Reduced-size reproductions may be provided instead of full-size drawings if reproductions are clear and legible. If reduced-size drawings are used, identify as "REDUCED SIZE" and provide graphic scales, if applicable.
    c. Custom Data: Data supplemented by drawings and schematics necessary to describe systems adequately.
    d. Equipment Data Sheet: Data, using form at end of this section.
    e. Schedules: Schedules reflecting final, as-installed conditions.
    f. Poorly reproduced or illegible data will be rejected.
3. Dividers: Divider sheets with Mylar reinforced edges and pre-printed numbered tabs aligned with numbers and title lines on index sheet. Include typed list of products and major components of equipment included in section on each divider, cross-referenced to Specification Section number and title of Project Manual.
4. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

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.

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
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.

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.
    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. Identify take-back programs and appropriate contact information for:
        1) Carpet
        2) Ceiling Tile
        3) Office Equipment
    d. 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, 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.

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.

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 01 77 00 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 78 23

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:	

END OF SECTION 01 78 23

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SECTION 01 79 00 - 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.

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
   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.

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.

1. DVDs with poor video or audio quality will be rejected and training recorded again.

END OF SECTION 01 79 00

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SECTION 01 91 14 - TOTAL BUILDING COMMISSIONING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. General requirements for coordinating and scheduling commissioning.
2. Commissioning meetings
3. Commissioning reports
4. Use of test equipment, instrumentation, and tools for commissioning.
5. Construction checklists, including, but not limited to, installation checks, startup, and performance tests.
6. Commissioning tests
7. Adjusting, verifying, and documenting identified systems and assemblies.
   Work included under this section includes a complete and thorough investigation of equipment and systems indicated in Part 3 of section. In order to ensure proper installation and operation of components and systems. Contractor shall perform commissioning as described herein to accomplish the tasks, and goals of commissioning. Systems to be evaluated include but are not limited to:
8. HVAC (Heating, Ventilation, and Air Conditioning) components and equipment.
9. HVAC system: Interaction of cooling, heating, and comfort delivery systems.
10. Building Automation System (BAS): Control hardware and software, sequence of operations, and integration of factory controls with BAS.
11. Lighting Control System and interface with daylighting.
12. Building Envelope (walls, roof, windows, infiltration, etc.)
13. Life Safety Systems (Fire Alarm & Suppression)
14. Electrical and Alternative Energy Systems (propane generator, photovoltaic panels, etc.)
15. Access Control/ Security Systems
16. Lightning Protection

B. National Park Service (NPS) personnel, Green Consultant, and Architect/Engineer, are not responsible for construction means, methods, job safety, or management function related to commissioning on job site.

C. Related Sections:

1. 01 31 00 - Project Management and Coordination
2. 01 33 23 - Submittal Procedures
3. 01 40 00 - Quality Requirements
4. 01 57 19.11 - Indoor Air Quality (IAQ) Management
5. 01 57 19.12 - Noise and Acoustics Management
6. 01 77 00 - Closeout Procedures
7. 01 78 23 - Operation and Maintenance Data
8. 01 79 00 - Demonstration and Training

1.2 DEFINITIONS

A. Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity.

B. Basis-of-Design Document: Document prepared by Designer that records concepts, calculations, decisions, and product selections used to comply with Owner's Project Requirements and to suit applicable regulatory requirements, standards, and guidelines.

C. Total Building Commissioning (TBC): Quality-focused process for verifying and documenting that facility, systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. Requirements specified here are limited to construction phase commissioning activities.

D. Construction Checklist: Form used by Contractor to verify appropriate components are on site, ready for installation, correctly installed and functional.

E. Contractor’s Commissioning Representative: (CCxR) Contractor’s designated individual to coordinate, manage, and execute commissioning processes of the contracting organizations.

F. Commissioning Plan (CCxP): Plan that provides structure, schedule and coordination planning for commissioning process proposed specifically for this project. CCxP includes Personnel, activities, and a description of Infrastructure, and list of instruments and logging devices that will be used during Commissioning.

G. Deficiency: Condition in the installation or function of a component, piece of equipment or system not in compliance with Contract Documents, does not perform properly or is not complying with Basis of Design.

H. Functional Performance Test (FPT): Test of dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system’s sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional performance testing, in the commissioning sense of the word. TAB’s primary work is setting up the system flows and pressures as specified, while functional testing is verifying that which has already been set up. The CCxR develops the sequentially written functional test procedure forms, and oversees and documents the actual testing, which is performed by the installing contractor or vendor. The CCxR creates worksheets from these forms which include procedures required to accommodate actual equipment, means and methods used in the project. Functional Performance Tests are performed after pre-functional checklists and startup is complete.

I. Manual Test: Using hand-held instruments, control system readouts or direct observation to verify performance (contrasted to analyzing electronically monitored data taken over time to make the "observation").

J. Monitoring: Recording of parameters (flow, current, status, pressure, etc.) of equipment operation using data loggers or the trending capabilities of control systems.

K. Owner's Project Requirements: Document originated by Designer that details functional requirements of project and expectations of use and operation, including project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. Document is updated, with input from Contracting Officer (CO) as required as project is finished.

L. Pre-functional Checklist: List of items to inspect and elementary component tests to conduct to verify proper installation of equipment. Pre-functional checklists are primarily static inspections and procedures to prepare equipment or system for initial operation (e.g., belt tension, oil levels ok, labels affixed, gages in place, sensors calibrated, etc.). However, some pre-functional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring voltage imbalance on a three-phase pump motor of a chiller system). Pre-functional" refers to "before" functional testing. Pre-functional checklists augment and are combined with the equipment manufacturer’s start-up checklist.

M. Seasonal Performance Tests: Functional Performance Tests deferred until system(s) will experience seasonal conditions closer to their design conditions.

N. Systems Manual: System focused composite document that includes operational manual, maintenance manual, and additional information of use to Government during Occupancy and Operation Phase.

1.3 COMMISSIONING TEAM

A. Members Appointed by Contractor(s): Individuals, each having authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action.

1. CCxR (Contractor’s Commissioning Representative): CCxR shall be approved by Contracting Officer and satisfy as many of the following requirements as possible:
   a. Certified in Commissioning by nationally accredited organization (i.e. Associated Air Balance Council (AABC), Association of Energy Engineers (AEE), Building Commissioning Association (BCA), and National Environmental Balancing Bureau (NEBB))
   b. Acted as principal Commissioning Authority where total building commissioning approach (including building envelope) was used for at least three projects of comparable size, type, and scope.
   c. Technical training in Mechanical, Electrical, and/or fire protection engineering.
   d. Past commissioning experience.
   e. Knowledge of national codes.
   f. Experience in energy-efficient design and control strategy optimization.
   g. Specific experience with specialty systems relative to particular facility type (i.e. Federal blast and progressive collapse requirements, security systems, etc.).
2. Contractor Quality Control (CQC) Supervisor
3. Other Representatives may include Project superintendents, installers, suppliers, and specialists.

B. Members Appointed by Contracting Officer:

1. Representatives of facility user and operation and maintenance personnel.
2. Architect and engineering design professionals.

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Each Contractor shall assign representatives with expertise and authority to act on its behalf to participate in and perform commissioning process activities including:

1. Perform commissioning tests, as required by technical specifications. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
2. Record and resolve commissioning issues.
3. Attend commissioning team meetings held on weekly basis.
4. Integrate and coordinate commissioning process activities with overall project schedule.
5. Review Construction Checklist attached at end of specification section.
6. Complete paper construction checklists as contract work is completed and provide to Contracting Officer on a daily basis.
7. Complete commissioning process test procedures.
8. Provide maintenance orientation and inspection for systems, assemblies, equipment, and components based on contract requirements.
9. Provide Commissioning Plan and documentation for final commissioning documentation.
10. Provide measuring instruments and logging devices to record test data and provide data acquisition equipment to record data for complete range of testing for required test period.

1.5 COMMISSIONING DOCUMENTATION

A. Provide the following information:

1. Review of systems manual, submittals, documents, and other commissioning reports
2. Identification of installed systems, assemblies, equipment, and components including design changes that occurred during the construction phase
3. Commissioning Plan including Process activities and schedule for completing construction checklists and manufacturer's pre-start and startup checklists for systems, assemblies, equipment, and components to be verified and tested
4. Certificate of readiness certifying systems, subsystems, equipment, and associated controls are ready for testing
5. Test and inspection reports and certificates
6. Corrective action documents
7. Testing, adjusting, and balancing reports

1.6 SUBMITTALS

A. Two-week look-ahead schedules: Schedule showing the next two weeks of commissioning related construction activity to include completion dates for each element of commissioning documentation for each major system or subsystem as identified in 1.1.B.

B. Certificates of readiness.

C. Contractor’s Commissioning Representative Qualifications.

D. Commissioning Plan: Submit within 30 calendar days of authorization to proceed.

1. Update as necessary during the work to reflect progress on components and systems.

E. Pre functional checklists.

F. Owner's project requirements.

G. Functional performance test forms: Submit minimum 30 calendar days prior to testing

H. List of test instrumentation, equipment, and monitoring devices. Include:
   1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
   2. Brief description of intended use.
   3. Calibration record showing:
      a. Calibration agency, including name and contact information
      b. Last date of calibration
      c. Range of values for which calibration is valid
      d. Certification of accuracy
      e. National Institute of Standards and Technology (NIST) traceability certification for calibration equipment.
      f. Due date of the next calibration.

I. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation. Document results from start-up/pre-functional checklists, functional performance testing, and short-term diagnostic monitoring. Include details of components or systems found to be non-compliant with drawings and specifications. Identify adjustments and alterations required to correct system operation and identify who is responsible for making corrective changes.
   1. Update as necessary during work to reflect progress on components and systems. Submit updated versions monthly.

J. Closeout Documentation
   1. Closeout documents for commissioned equipment and systems shall be submitted prior to functional performance testing. These include:
      a. Record Documents and Drawings
      b. Start-up certificates for commissioned equipment with start-up requirements
      c. Systems Manual
      d. Include TAB, startup, and Control System check-out reports.
      e. Other documents required by Section 01 77 00.
   2. Operation and Maintenance (O&M) Submittals (refer to requirements of technical specifications):
      a. Training plan: Include for each training session:
         1) Dates, start and finish times, and locations
         2) Outline of the information to be presented
         3) Names and qualifications of presenters
         4) List of texts and materials required to support training

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

A. Instrumentation shall:

1. Be of sufficient quality and accuracy to test and measure system performance within tolerances required to determine adequate performance.
2. Be calibrated on manufacturer's recommended intervals calibration tags permanently affixed to instrument being used.
3. Be maintained in good repair and operation condition throughout duration of use on this project.

B. Standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by Contractor for equipment being tested.

C. Required commissioning equipment (sensors, transducers, data loggers, etc.) not integral to the systems or equipment installed shall be provided by Contractors Commissioning Representative and shall not become property of the Government.

2.2 PRE-FUNCTIONAL CHECKLIST

A. Prepare pre functional checklists for equipment and systems to be commissioned.

B. Pre-functional checklists shall be complementary to Commissioning Plan and Commissioning Schedule.

2.3 FUNCTIONAL TEST PROCEDURE FORMS

A. Prepare functional test procedure forms for each piece of equipment and each system to be commissioned.

2.4 FUNCTIONAL PERFORMANCE WORKSHEETS

A. Prepare Functional Performance worksheets, consisting of test procedures and expected results of testing.

2.5 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label front cover and spine of each binder with report title, volume number, project name, Contractor's name, and date of report.
3. Record report on compact disk.
4. Electronic Data: Portable document format (PDF); a single file with outline-organized bookmarks for major and minor tabs and tab contents itemized for specific reports.

B. Commissioning Report:

1. Include table of contents and an index to each test.
2. Include major tabs for each Specification Section.
3. Include minor tabs for each test.
4. Within each minor tab, include:
   a. Test specification.
   b. Pre-startup reports.

c. Approved test procedures.
d. Test data forms, completed and signed.
e. Commissioning issue reports, showing resolution of issues, and documentation related to resolution of issues pertaining to a single test. Group data forms, commissioning issue reports showing resolution of issues, and documentation related to resolution of issues for each test repetition together within minor tab, in reverse chronological order (most recent on top).

PART 3 EXECUTION

3.1 COMMISSIONING PROCESS

A. Following activities outline general commissioning tasks (requiring development, execution, etc.) and order in which they occur.

1. Commissioning Scoping Meeting
2. Finalize Owner's Project Requirements
3. Commissioning Plan
4. Prepare pre-functional checklists.
5. Prepare functional performance worksheets.
6. Perform Start-Up/Pre-Functional Checks in accordance with manufacturer's recommendations and pre-functional checklists.
7. Functional Performance Testing in accordance with functional performance worksheets
8. Deficiency Report and Resolution Record
9. Operation and Maintenance Documentation
10. Operations and Maintenance Training
11. Deferred Testing

3.2 TOTAL BUILDING COMMISSIONING (TBC) REQUIREMENTS

A. TBC during construction, acceptance, and warranty phases is intended to achieve following specific objectives:

1. Verify that systems and equipment meet Owner's Project Requirements.
2. Verify equipment is what was submitted and approved.
3. Verify and document equipment is installed and started per manufacturer's recommendations, industry accepted minimum standards, and Contract Documents.
4. Verify and document equipment and systems receive complete operational checkout by installing contractors.
5. Verify and document equipment capacity and system efficiency.
6. Verify performance of building envelope. Document testing and conformance to Contract Documents.
7. Verify completeness of operations and maintenance materials.
8. Ensure Governments operating personnel are adequately trained on operation and maintenance of building equipment.

3.3 COMMISSIONING SCOPING MEETING

A. Commissioning Scoping Meeting:

1. Schedule, coordinate, and facilitate a scoping meeting.

2. Review each building system to be commissioned, including intended operation, commissioning requirements, and completion and start-up schedules.
3. Establish scope of work, tasks, schedules, deliverables, and responsibilities for implementation of Commissioning Plan.
4. Attendance: Commissioning Team members.

3.4 COMMISSIONING PLAN

A. Commissioning Plan: Develop commissioning plan to identify how commissioning activities will be integrated into general construction and trade activities. Commissioning plan shall identify how commissioning responsibilities are distributed. Intent of plan is to evoke questions, expose issues, and resolve issues with input from entire commissioning team early in construction.

1. Identify who will be responsible for producing various procedures, reports, Contracting Officer notifications and forms.
2. Include commissioning tasks and activities in overall project schedule. Tag individual activities so they can be filtered at later date.
3. List and describe each test/acceptance procedure, including acceptance criteria.

3.5 START-UP/PRE-FUNCTIONAL CHECKLISTS

A. Start-Up/Pre-Functional Checklists: Complete pre-functional checklists prior to start up. Checklist shall help verify that systems are complete and operational, so functional performance testing can be scheduled.

1. Verify equipment installed is what was approved on Submittal.
2. Manufacturer’s start-up checklists and other technical documentation guidelines may be used as basis for pre-functional checklists.

3.6 FUNCTIONAL PERFORMANCE TESTING

A. Functional Performance Testing: Test procedures fully describe system configuration and steps required for each test.

1. Test Methods: Functional performance testing and verification may be achieved by direct manipulation of system inputs (i.e. heating or cooling sensors), manipulation of system inputs with building automation system (i.e. software override of sensor inputs), trend logs of system inputs and outputs using building automation system, or short-term monitoring of system inputs and outputs using standalone data loggers. A combination of methods may be required to completely test complete sequence of operations. CCxR shall determine which method or combination of methods is most appropriate.
2. Setup: Each test procedure shall be performed under conditions that simulate normal operating conditions as closely as possible. Where equipment requires integral safety devices to stop/prevent equipment operation unless minimum safety standards or conditions are met, functional performance test procedures shall demonstrate actual performance of safety shutoffs in real or closely simulated conditions of failure.
3. Sampling: Multiple identical pieces of non-life-safety or non-critical equipment may be functionally tested using a sampling strategy. If, after three attempts at testing the specified sample percentage, failures are still present, remaining units shall be tested at Contractors’ expense.

B. Prepare functional performance test procedure forms to accommodate actual installed equipment and systems.

C. Coordinate, execute, and record results of functional performance testing.

1. Coordinate retesting as necessary until satisfactory performance is verified.
2. Verify intended operation of individual components and system interactions under various conditions and modes of operation.

3.7 DEFICIENCY REPORT AND RESOLUTION RECORD

A. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation.

B. Non-Conformance. Non-conformance and deficiencies observed shall be addressed immediately. Notify responsible parties and provide recommended actions to correct deficiencies.

1. Corrections of minor deficiencies identified may be made during tests at discretion of CCxR. In such cases the deficiency and resolution shall be documented on procedure form.
2. For identified deficiencies:
   a. If no dispute on deficiency and responsibility to correct it:
      1) CCxR documents deficiency and adjustments or alterations required to correct it. Contractor corrects deficiency and notifies CCxR that equipment is ready to be retested.
      2) CCxR reschedules test and test is repeated until satisfactory performance is achieved.
   b. If there is a dispute about a deficiency or who is responsible:
      1) Deficiency is documented CCxR on non-compliance form.
      2) Resolutions are made at lowest management level possible. Additional parties are brought into discussions as needed. Contractor shall have responsibility for resolving construction deficiencies. If a design revision is deemed necessary and approved by Contracting Officer, Architect/Engineer (A/E) shall have responsibility for providing design revision. CCxR documents resolution process.
      3) Once interpretation and resolution have been decided, appropriate party corrects deficiency and notifies CCxR that equipment is ready to be retested. CCxR reschedules test and test is repeated until satisfactory performance is achieved.
3. Cost of Retesting: Costs for retesting shall be charged to Contractor.

3.8 OPERATIONS AND MAINTENANCE TRAINING

A. Training: Develop Training Plan. Coordinate and execute training programs with CxA.

1. Stress and enhance importance of system interactions, troubleshooting, and long-term preventive maintenance and operation programs.

3.9 DEFERRED TESTING

A. Unforeseen Deferred Tests: If test cannot be completed due to building structure, required occupancy condition, or other deficiency, functional testing may be delayed upon

recommendation of CCxR and approval of Contracting Officer. These tests are conducted in same manner as the seasonal tests, as soon as possible.

B. Seasonal Testing

1. Schedule, coordinate, execute, and document additional testing for seasonal variation in operations and control strategies during appropriate season to verify performance of HVAC system and controls. Complete testing during warranty period to fully test sequences of operation.
2. Update O&M manuals and Project Record Drawings as necessary due to testing.

3.10 EQUIPMENT & SYSTEM SCHEDULE

A. Commissioned Equipment and Systems List: Following is a list of systems and equipment to be commissioned organized by system. Contractor shall propose percentage of each category that will undergo testing for review in submitted commissioning plan. The intent is to provide an overall summary of commissioned equipment and systems, and not a comprehensive list. Refer to applicable specification sections for more information.

COMMISSIONED EQUIPMENT AND SYSTEMS LIST			
SYSTEM	EQUIPMENT	CC	FPT
ELECTRICAL	LIGHT FIXTURES (ALL)	X	X
ELECTRICAL	LIGHTING CONTROLS (ALL)	X	X
PLUMBING	WATER HEATERS (WHE-3, WHE-4)	X	X
PLUMBING	HOT WATER RECIRCULATION PUMP (CP-1)	X	X
HVAC	FAN COILS (FC-1A, FC-1 THRU FC-5)	X	X
HVAC	CHILLER (CH-1)	X	X
HVAC	CIRCULATION PUMP (CP-1)	X	X
HVAC	EXHAUST FANS (EF-1, EF-1A)	X	X
HVAC	VRF HEAT PUMP (VRHP-1)	X	X
HVAC	VRF FAN COILS (VRFC-1 THRU VRFC-5)	X	X
HVAC	CONDENSING UNIT (CU-1A)	X	X
HVAC	AIR CURTAINS (AC-1 THRU AC-3)	X	X

Notes:

1. CC = Commissioning Coordinator
2. FPT = Functional Performance Test

END OF SECTION 01 91 14

SECTION 02 41 00 - DEMOLITION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Building demolition .

B. Selective demolition of built site elements.

C. Selective demolition of building elements for alteration purposes.

D. Abandonment and removal of existing utilities and utility structures.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Limitations on Contractor's use of site and premises.

B. Section 01 10 00 - Summary: Description of items to be salvaged or removed for re-use by Contractor.

C. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

D. Section 01 57 13 - Temporary Erosion and Sediment Control.

E. Section 01 60 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.

F. Section 01 70 00 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

G. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

H. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2019.

1.4 ACTION SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Site Plan: Showing:

1. Vegetation to be protected.
2. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

1.5 INFORMATIONAL SUBMITTALS

A. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.

1. Minimum of five years of documented experience.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SCOPE

A. Remove fences and gates.

B. Remove other items indicated, for salvage, relocation, and recycling.

C. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as specified in Section 31 22 00.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.

1. Obtain required permits.
2. Comply with applicable requirements of NFPA 241.
3. Use of explosives is not permitted.
4. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
5. Provide, erect, and maintain temporary barriers and security devices.
6. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
8. Do not close or obstruct roadways or sidewalks without permit.
9. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
10. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.

B. Do not begin removal until receipt of notification to proceed from Government.

C. Do not begin removal until built elements to be salvaged or relocated have been removed.

D. Do not begin removal until vegetation to be relocated has been removed and specified measures have been taken to protect vegetation to remain.

E. Protect existing structures and other elements that are not to be removed.

1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.

F. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

G. If hazardous materials are discovered during removal operations, stop work and notify Contracting Officer and Government; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

H. Perform demolition in a manner that maximizes salvage and recycling of materials.

1. Comply with requirements of Section 01 74 19 - Waste Management.
2. Dismantle existing construction and separate materials.
3. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

3.3 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Government.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Government.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

H. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.4 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.

1. Verify that construction and utility arrangements are as indicated.
2. Report discrepancies to Contracting Officer before disturbing existing installation.
3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing work as indicated and as required to accomplish new work.

1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.

1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
3. Verify that abandoned services serve only abandoned facilities before removal.
4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

D. Protect existing work to remain.

1. Prevent movement of structure; provide shoring and bracing if necessary.
2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
3. Repair adjacent construction and finishes damaged during removal work.
4. Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 02 41 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.

B. ASTM C618 - Standard Specification for Coal Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2025a.

C. ASTM C1240 - Standard Specification for Silica Fume Used in Cementitious Mixtures; 2020.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 SUMMARY

A. Description:

1. This section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
   a. Footings.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All cast-in-place concrete work on this project shall conform to the Construction Documents, applicable building code including referenced standards, the requirements of “Specification for Structural Concrete” ACI 301-16 (Chapters 1-5, & Chapters 6-14 as applicable) and "Specifications for Tolerances for Concrete Construction and Materials" ACI 117, in coordination with clarifications, exemptions, and additions in the Construction Documents.

C. Related Sections:

1. Division 03 Specifications – Concrete Construction.
2. Division 31 Specifications – Earthwork.

1.4 QUALITY ASSURANCE

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures,

curing procedures, construction contraction and isolation joints, joint-filler strips, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.5 SUBMITTALS

A. Design Mixtures:

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

B. Cold-Weather Placement: Submit detailed procedures for cold weather concreting in accordance with ACI 306.1.

C. Hot-Weather Placement: Submit detailed procedures for hot weather concreting in accordance with ACI 305.1.

D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

E. Formwork layout and dimension shop drawings.

F. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates

G. Material Certificates: For each of the following as applicable on the project, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Curing compounds.
6. Bonding agents.
7. Adhesives.
8. Repair materials.

H. Minutes of preinstallation conference.

PART 2 PRODUCTS

2.1 FORM-FACING MATERIALS

A. Comply with ACI 301.

B. Earth forms may be used for footing forms where sides of the excavation are cut true, in firm soil. If earth is not suitable to be used as “earth form,” no consideration will be given to any claim for additional cost of formwork. Contractor shall provide material and labor to provide formwork without additional cost to Owner.

2.2 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615 Grade 60 deformed.

2.3 REINFORCEMENT ACCESSORIES

A. Bar Supports: Manufacture bar supports from plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete for use in foundations and slabs-on-grade only.

2.4 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I, or Type II. Supplement with the following:
   a. Fly Ash: ASTM C618, Class F or C.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
2. Blended Hydraulic Cement: ASTM C 595, Type IS portland blast-furnace slag, Type IP portland-pozzolan, Type I (PM) pozzolan-modified Portland, Type I (SM) slag-modified portland cement.

B. Silica Fume: ASTM C1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Select grading class per type of construction or location used, and in relation to specific weathering region. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: See schedule on Construction Drawings.

D. Water: Shall be potable.

2.5 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 and ACI 318 chapter 5. Design mixtures shall meet the minimum requirements tabulated in the construction documents.

B. Cementitious Materials: Use fly ash, pozzolan, ground granulated blast-furnace slag, and silica fume as needed. Requirements of table 4.1.2.9 of ACI 301 shall be adhered to.

C. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing, plasticizing, or retarding admixtures in concrete, as required, for placement and workability, and project specific conditions.

2.7 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.8 CONCRETE MIXING

A. Ready-Mixed Concrete:

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 EXECUTION

3.1 FORMWORK

A. Limit concrete surface irregularities, designated by ACI 347R as abrupt or gradual, as follows:

1. Class A, 1/8 inch for exposed smooth-formed finished surfaces.
2. Class B, 1/4 inch for exposed rough-formed finished surfaces.

3.2 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Field bending or straightening of reinforcing bars partially embedded in concrete is prohibited unless specifically permitted by Structural Engineer of Record. Comply with ACI 301 procedures for field bending and straightening.

3.3 CONCRETE PLACEMENT

A. Do not add water to concrete during delivery or at Project site. Add water at project site only as noted on delivery ticket, and prior to beginning placement.

B. Cold-Weather Placement: Comply additionally with ACI 306.1 and as follows:

1. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

C. Hot-Weather Placement: Comply additionally with ACI 305.1 and as follows:

1. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.

3.4 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Broom Finish: Apply a broom finish to exterior concrete platforms, steps and ramps, and elsewhere as indicated.

1. Coordinate required final finish with Architect before application.

3.5 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 301, ACI 305, ACI 306, and ACI 306.1 as applicable.

B. Cure concrete according to ACI 308.1, by one or a combination of the methods allowed in ACI 301.

3.6 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Contracting Officer. Remove and replace concrete that cannot be repaired and patched to Contracting Officer approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning per ACI 301, to the satisfaction of the Architect/Structural Engineer of Record.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. For areas out of tolerance or specification, Contractor shall propose correction method to Architect/Structural Engineer of Record for approval.

3.7 FIELD QUALITY CONTROL

A. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample set for each 75 cu. yd. or fraction thereof of each concrete mixture placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143; one test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
4. Air Content: ASTM C231 or ASTM C173 as applicable, one test for each composite sample, but not less than one test for each day’s pour of each concrete mixture.
5. Compression Test Specimens: ASTM C 31.
    a. Cast and cure a minimum of four 6”x12” or five 4”x8” cylinder specimens for each composite sample.
    b. Additional cylinders to be cast for high-early strength concrete and as required for contractor’s means and methods.

6. Compressive-Strength Tests: ASTM C 39; test one specimen at 7 days and one set of two (6”x12”)/three (4”x8”) specimens at 28 days. Should 28 day strength not be met, test remaining cylinder at 56 days. Should 28 day strength be met, remaining cylinder may be discarded. Additional tests for high-early strength concrete and as required for contractor’s means and methods.

END OF SECTION 03 30 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

B. AISC 360 - Specification for Structural Steel Buildings; 2022, with Errata (2025).

C. ASTM A6/A6M - Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling; 2019.

D. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019.

E. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

F. SSPC-PA 1 - Shop, Field, and Maintenance Coating of Metals; 2024, with Errata (2025).

G. SSPC-SP 2 - Hand Tool Cleaning; 2024.

H. SSPC-SP 3 - Power Tool Cleaning; 2024.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 SUMMARY

A. Description:

1. This section includes elements of the structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
2. This section does not include Miscellaneous Metal Fabrications.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All Structural Steel work on this project shall conform to the Construction Documents, applicable building code including referenced standards, and the requirements of AISC 360 “Specification for Structural Steel Buildings”, RCSC “Specification for Structural Joints Using High-Strength Bolts”, and AISC 303 “Code of Standard Practice for Steel Buildings and Bridges” in coordination with clarifications, exemptions, and additions in the Construction Documents.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.
2. Division 09 Specification – Finishes

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code - Steel."

C. Preinstallation Conference: Conduct conference at Project Site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.
5. Forged-steel hardware.
6. Shop primer.
7. Galvanized-steel primer.
8. Etching cleaner.
9. Galvanized repair paint.
10. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members not to be shop primed.

1.6 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and Fabricator.

B. Welding certificates.

C. Material (Mill) test reports for structural steel, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Steel headed stud anchors (shear connectors/shear studs).
5. Shop primers.

E. Source quality-control reports.

F. Survey of existing conditions.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting fasteners after lubrication.

1.8 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

C. All Structural Steel not receiving fire-proofing shall receive one shop coat of rust-inhibitive primer. All steel with exterior exposure shall be painted with a double coat of rust prohibitive epoxy primer (material and thickness to be specified by Architect) unless noted as galvanized or architecturally exposed structural steel.

PART 2 PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Provide Structural Steel materials meeting the standards and grades set forth in the Construction Drawings.

2.2 BOLTS, CONNECTORS, AND ANCHOR RODS

A. Provide Bolts, Connectors, and Anchors of materials meeting the standards and grades set forth in the Construction Drawings.

2.3 SHRINKAGE-RESSISTANT GROUT

A. Provide shrinkage-resistant grout materials meeting the standards and grades set forth in the Construction Drawings.

2.4 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with AISC 303 "Code of Standard Practice for Steel Buildings and Bridges" and to AISC 360.

1. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
2. Mark and match-mark materials for field assembly.
3. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermally cut, or punch holes perpendicular to steel surfaces. Do not free-hand thermally cut bolt holes or enlarge holes by burning.

D. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members only as indicated in Structural Construction Drawings.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not free-hand thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 PRIMER PAINT

A. Fabricator's standard rust-inhibiting grey primer. Do not prime steel that is to receive fire-proofing spray. Provide finish where indicated on Construction Drawings (see Architectural Drawings and Division 09 specifications).

2.6 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to Structural Steel according to ASTM A123.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels, shelf angles, any framing exposed to earth or weather, and other framing as indicated in the Construction Drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify, with Steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep Structural Steel secure, plumb, and in alignment against temporary construction loads and loads equal in

intensity to design loads. Remove temporary supports when permanent Structural Steel, connections, bracing, and diaphragms are in place unless otherwise indicated.

3.3 ERECTION

A. Set Structural Steel accurately in locations and to elevations indicated and in accordance with AISC 303 and AISC 360.

B. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of base plate where indicated in Structural Construction Drawings.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of Structural Steel within AISC 303 "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1 and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified in the Construction Drawings.

B. Weld Connections: Comply with AWS D1.1 for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIRS AND PROTECTION

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

C. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.

END OF SECTION 05 12 00

SECTION 05 40 00 - COLD-FORMED STEEL FRAMING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).

B. AISI S240 - North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).

C. ASTM A1003/A1003M - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.

D. ASTM C1513 - Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections; 2024.

E. ICC-ES AC70 - Acceptance Criteria for Power-Actuated Fasteners Driven into Concrete, Steel and Masonry Elements; 2019, with Editorial Revision (2021).

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this section.

1.3 SUMMARY

A. Section Includes:

1. Load-bearing wall framing
2. Floor joist framing

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All Cold-Formed Steel Framing work on this project shall confirm to the Construction Documents, applicable building code including referenced standards, and the requirements of AISI S100 “North American Specification for the Design of Cold-formed Steel Structural Members”, AISI S240 “North American Standard for Cold-formed Steel Structural Framing”, and AISI S202 “Code of Standard Practice for Cold-formed Steel Structural Framing” in coordination with clarifications, exemptions, and additions in the Construction Documents.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.

1.4 QUALITY ASSURANCE

A. Framing members shall be manufactured and supplied by one manufacturer and be of the type and size as indicated on Construction Drawings and/or Shop Drawings.

B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements,

including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code–Steel," and AWS D1.3, "Structural Welding Code–Sheet Steel."

D. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory indicated.

B. Shop Drawings: Submit Shop Drawings showing fabrication and erection procedures. Shop Drawing (if indicated as a requirement by this specification) shall bear the seal of a registered design professional licensed in the state in which the project is located.

1. Show locations, sizes, gauges, spacing and types of framing composites, details of connections and framing of windows, doors and punched openings.
2. Indicate all prefabricated framing with individual panels shown for each condition. Indicate member properties, details of connections, all erection and permanent bracing required.
3. Indicate supplemental strapping, bracing, splices, bridging, accessories, and details required for installation.
4. Shop Drawings shall indicate sequence and method of erection details of all connection of cold-formed steel framing to other elements of the building structure.
5. Indicate shop and field assembly details, including cut and connections.
6. Indicate type and location of welds, bolts, and fastening devices.

C. Delegated-Design Submittal: For work indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the registered design professional responsible for their preparation.

D. Structural design calculations: Indicate compliance with specified design criteria. Calculations shall bear the seal of a registered design professional licensed in the state in which the project is located.

1.6 INFORMATION SUBMITTALS

A. Welding certificates.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect cold-formed steel framing from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Store cold-formed steel framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Employ a qualified design professional, licensed in the state in which the project is located, to perform design and prepare signed and sealed Shop Drawings and

Calculations for submittal. Comply with design intent, criteria, and requirements of the Construction Documents.

B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated in the Construction Documents.
   1. Design Loads: As indicated in the Construction Documents.
   2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
      a. Wall Framing: Horizontal deflection L/240.
      b. Floor Joist Framing: Vertical deflection of 1/480 for live loads and l/360 for total loads of the span.
   3. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as indicated in the Construction Documents.

C. In addition to design loads all cold-formed members shall be sized for the connection requirements of the cladding and/or framing which attaches to them, including but not limited to sheathing, paneling, doors, windows, louvers, minor canopies, and sun shades.

D. Existing Conditions: Inspect structure for compliance with specified erection tolerances.

E. Design and coordinate installation and location of anchors and inserts with structural system to which cold-formed steel framing is attached.

2.2 MATERIALS

A. Steel Sheet: ASTM A1003, Structural Grade, Type H, minimum 20 gauge, metallic coated, of grade and coating designation as follows:
   1. Grade:
      a. ST33H for 33 mil and 43 mil
      b. ST50H for 54 mil, 68 mil, and 97 mil
   2. Coating:
      a. G60.

2.3 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
   1. Minimum Base-Metal Thickness: 0.0428 inch.
   2. Flange Width: 1-5/8 inches.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
   1. Minimum Base-Metal Thickness: Matching steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated or as required by design, unpunched, with stiffened flanges.

2.4 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, unpunched and without splices.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Supplementary framing.
2. Bracing, bridging, and solid blocking.
3. Web stiffeners.
4. Anchor clips.
5. End clips.
6. Foundation clips.
7. Gusset plates.
8. Stud kickers, knee braces, and girts.
9. Joist hangers and end closures.
10. Hole reinforcing plates.
11. Backer plates.

2.6 ANCHORS, CLIPS, AND FASTENERS

A. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

B. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

C. Welding Electrodes: Comply with AWS standards.

2.7 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true-to-line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding or screw fastening, as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, or screw fastening, according to Shop Drawings and manufacturer’s requirements.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true-to-line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/4 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances in AISI S202 and other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S202, and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true-to-line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place,

undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Handling and lifting of prefabricated panels or assemblies shall be done in a manner as to not cause distortion or damage in any member, or damage to any connection.

H. Loads placed on panels or assemblies during erection shall not exceed design loads.

I. Do not bridge building expansion and control joints with cold-formed steel framing. Independently frame both sides of joints.

J. If required, install insulation, specified in Division 07, in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

K. Erection Tolerances: Install cold-formed steel framing level, plumb, and true-to-line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/4 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacing as follows:

1. Anchor Spacing: As required by design, but not to exceed 24 inches max, and within 3 inches of ends.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated or as required by design.

C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated or required by design.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks, jack studs, and cripple studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically at 48 inches. Decrease spacing as required by design. Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with required end bearing.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: as indicated or as required by design.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated on Shop Drawings.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals as indicated or as required by design. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 53 00 - METAL GRATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Formed metal floor gratings.

B. Flat surface floor and stair tread plating.

C. Perimeter closure.

1.2 RELATED REQUIREMENTS

A. Section 05 50 00 - Metal Fabrications.

1.3 REFERENCE STANDARDS

A. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

E. ASTM A786/A786M - Standard Specification for Hot-Rolled Carbon, Low-Alloy, High-Strength Low-Alloy, and Alloy Steel Floor Plates; 2015.

F. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

G. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012.

H. ASTM B211M - Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold-Finished Bar, Rod, and Wire (Metric); 2012.

I. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

J. NAAMM MBG 531 - Metal Bar Grating Manual; 2017.

K. NAAMM MBG 532 - Heavy Duty Metal Bar Grating Manual; 2009.

L. SSPC-Paint 20 - Zinc-Rich Coating (Type I - Inorganic, and Type II - Organic); 2019.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide span and deflection tables.

C. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

D. Manufacturer's Installation Instructions: Indicate special requirements for opening and perimeter framing.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Design gratings and plates under direct supervision of a Professional Structural Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: McNichols Co. .

B. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.

2.3 MATERIALS

A. Steel Floor Plate: ASTM A786/A786M; manufacturer's standard pattern.

B. Sheet Steel for Die Stamping: ASTM A1011/A1011M Designation CS hot-rolled sheet.

C. Steel For Welding or Riveting: ASTM A36/A36M unfinished, of shapes indicated.

D. Steel Sheet for Lock Forming: Hot-dipped galvanized, ASTM A653/A653M, FS Type B, with G90/Z275 coating.

E. Steel Framing: ASTM A36/A36M shapes, galvanized per ASTM A123/A123M.

F. Cross Bars: ASTM B211 ASTM B211M solid bars.

G. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

H. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20 Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.4 ACCESSORIES

A. Fasteners and Saddle Clips: Galvanized steel:

B. Perimeter Closure: Of same material as grating.

2.5 FABRICATION

A. Fabricate grates to sizes indicated.

B. Mechanically clinch joints of intersecting metal sections.

C. Fabricate support framing for openings.

D. Top Surface: Non-slip.

E. Bearing Bar: 3/16 by 1-1/2 inch size, spaced 1-3/16 inches on center.

F. Cross Bar: 1/4 by 1/4 inch size, spaced 4 inches on center.

2.6 FINISHES

A. Galvanizing for Steel Shapes: ASTM A123/A123M.

B. Galvanizing for Steel Hardware: ASTM A153/A153M.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated on drawings.

B. Verify that opening sizes and dimensional tolerances are acceptable.

C. Verify that supports are correctly positioned.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions.

B. Place frames in correct position, plumb and level.

C. Mechanically cut galvanized finish surfaces. Do not flame cut.

D. Set perimeter closure flush with top of grating and surrounding construction.

E. Secure to prevent movement.

3.3 TOLERANCES

A. Comply with NAAMM MBG 531.

B. Comply with NAAMM MBG 532.

END OF SECTION 05 53 00

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SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASME B18.2.1 - Square, Hex, Heavy Hex, and Askew Head Bolts and Hex, Heavy Hex, Hex Flange, Lobed Head, and Lag Screws (Inch Series); 2012 (Reaffirmed 2021).

B. ASME B18.6.1 - Wood Screws (Inch Series); 1981 (Reaffirmed 2016).

C. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

D. ASTM D2559 - Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions; 2012a (Reapproved 2024).

E. ASTM D5456 - Standard Specification for Evaluation of Structural Composite Lumber Products; 2021, with Editorial Revision.

F. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.

G. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Speciation Sections, apply to this section.

1.3 SUMMARY

A. Description:

1. This section includes framing with dimension lumber, framing with timber, framing with engineered wood products, wood blocking, and nailers.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All Rough Carpentry work on this project shall confirm to the Construction Documents and applicable building code including referenced standards.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.
2. Division 09 Specification – Finishes

1.4 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

B. Grade Marks: Identify all lumber and plywood by official grade marks.

1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable, and condition of seasoning at time of manufacture.

2. Softwood Plywood: Appropriate grade trademark of the American Plywood Association indicating:
   a. Type, grade, class and identification index.
   b. Inspection and testing agency mark.

1.5 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
   1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
   2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
   3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Immediately upon delivery to the job site, place materials in areas protected from weather.

B. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

C. Store materials a minimum of 6” above ground on blocking and cover with protected waterproof covering, providing for adequate air circulation and ventilation.

D. Do not store seasoned materials in wet or damp portions of building.

PART 2 PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: 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. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
   3. 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 engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1

1. Preservative Chemicals: Acceptable to authorities having jurisdiction.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. 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.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Construction Drawings.

2.3 DIMENSION LUMBER FRAMING

A. Dimensions: Indicated lumber dimensions are nominal. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and all the rules writing agencies.

B. Maximum Moisture Content shall be as noted in the Construction Drawings.

C. Non-Load-Bearing Interior Partitions shall be of a grade, species, and modulus of elasticity noted in the Construction Drawings.

D. Exterior and Load-Bearing Walls shall be of a grade, species, and modulus of elasticity in the Construction Drawings.

E. Joists, Rafters, and Other Framing Not Listed Above shall be of a grade, species, and modulus of elasticity noted in the Construction Drawings.

F. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.

1. Species and Grade: As indicated above for load-bearing construction of same type.

2.4 TIMBER FRAMING

A. Timber framing shall be off a dimension, grade, species, and modulus of elasticity noted in the Construction Drawings.

2.5 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 D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer(s) noted in the Construction Drawings.
2. Laminated-Veneer Lumber shall be of an allowable stress and modulus of elasticity noted in the Construction Drawings.

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 D5456 and manufactured with an exterior-type adhesive complying with ASTM D2559

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer(s) noted in the Construction Drawings.
2. Parallel-Strand Lumber shall be of an allowable stress and modulus of elasticity noted in the Construction Drawings.

2.6 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. Dimensions: Indicated lumber dimensions are nominal. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and all the rules writing agencies.

C. Maximum Moisture Content shall be as noted in the Construction Drawings.

D. Miscellaneous Lumber shall be off a grade, species, and modulus of elasticity noted in the Construction Drawings.

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated in Construction Drawings that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Post-Installed Anchors: All expansion, screw, and adhesive anchors shall be as noted in the Construction Drawings.

2.8 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the manufacturer(s) noted in the Construction Drawings.

B. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Construction Drawings.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate

fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions.

E. Do not splice structural members between supports, unless otherwise indicated.

F. Provide blocking and framing as indicated in Construction Drawings and as required to support facing materials, fixtures, specialty items, and trim.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated in Construction Drawings, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Governing Model Code with relevant Addenda, referenced in Construction Drawings, and all related and referenced Standards.

J. 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; do not countersink nail heads, unless otherwise indicated.

K. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions. Fasten plates to supporting construction, unless otherwise indicated.

1. Overlap double top plate minimum of 6” at corners and intersections, as follows.
2. Toenail studs to bottom plate and end-nail to lower top plate.

B. Provide studs in continuous lengths without splices.

1. Provide studs of a size and spacing as designated in the Construction Drawings.

C. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions, where sheathing is not present in finished construction.

D. Construct corners and intersections with three or more studs, where not explicitly noted or scheduled in Construction Drawings.

E. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. Provide king studs, jamb studs, and headers as noted in Construction Drawings.

3.4 JOIST AND RAFTER FRAMING INSTALLATION

A. General: Install floor 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 noted in the Construction Drawings.

B. 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.

C. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together by toe nailing or metal connectors. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.

D. Provide solid blocking between joists under jamb studs for openings.

E. Provide bridging at intervals of 96 inches o.c., between joists.

F. Rafters: Notch to fit exterior wall plates and toe nail or 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, bevel ends of jack rafters for full bearing against valley rafters. Where not specifically noted otherwise in Construction Drawings, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper.
2. At hips, bevel ends of jack rafters for full bearing against hip rafter. Where not specifically noted otherwise in Construction Drawings, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper.

3.5 TIMBER FRAMING INSTALLATION

A. Install timber with crown edge up and provide not less than 4 inches of bearing on supports. Provide continuous members, unless otherwise indicated; tie together over supports as indicated if not continuous.

B. Install wood posts using metal anchors indicated.

C. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

END OF SECTION 06 10 00

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SECTION 06 16 00 - WOOD SHEATHING

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASME B18.6.1 - Wood Screws (Inch Series); 1981 (Reaffirmed 2016).

B. PS 1 - Structural Plywood; 2009.

C. PS 2 - Performance Standard for Wood-Based Structural-Use Panels; 2010.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Speciation Sections, apply to this section.

1.3 SUMMARY

A. Description:

1. This section includes floor sheathing.

B. Related Documents and Standards:

1. All referenced standards and cited publications shall be those specifically denoted within the applicable building code noted in the General Notes of the Construction Drawings.
2. All Rough Carpentry work on this project shall conform to the Construction Documents and applicable building code including referenced standards.

C. Related Sections:

1. Division 05 Specifications – Steel Construction.
2. Division 06 Specification – Wood.

1.4 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Immediately upon delivery to the job site, place materials in areas protected from weather.

B. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

C. Store materials a minimum of 6” above ground on blocking and cover with protected waterproof covering, providing for adequate air circulation and ventilation.

D. Do not store seasoned materials in wet or damp portions of building.

E. Protect sheet materials from breaking corners and damaging surfaces.

PART 2 PRODUCTS

2.1 WOOD PANEL PRODUCTS, GENERAL

A. Plywood: DOC PS 1. Tongue and Groove (where noted).

B. Oriented Strand Board: DOC PS 2.

C. Thickness: As noted in the Construction Drawings

D. Factory mark panels to indicate compliance with applicable standard.

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Provide G90 hot-dipped galvanized steel or Type 304 stainless steel for components for all non-pressure treated and fire-retardant treated sheathing except nails shall be hot-dipped galvanized.
2. Material and finish for use with pressure preservative treated components or exposed to weather shall be G185 hot-dipped galvanized steel or Type 316L stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Steel Framing: shall be coordinated with Division 05 specifications.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Steel Framing: shall be coordinated with Division 05 specifications.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated on Construction Drawings, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Governing Model Code with relevant Addenda, referenced in Construction Drawings, and all related and referenced Standards.

D. Use common wire nails, unless otherwise indicated. 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. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30S, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated in the Construction Drawings:

1. Allow 1/8” between end joints and 1/4” between edge joints for expansion and contraction.
2. Provide sheathing clips at midspan of roof sheathing.

END OF SECTION 06 16 00

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SECTION 06 20 00 - FINISH CARPENTRY

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Finish carpentry items.

B. Wood casings and moldings.

C. Hardware and attachment accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Support framing, grounds, and concealed blocking.

B. Section 06 41 00 - Architectural Wood Casework: Shop fabricated custom cabinet work.

C. Section 08 14 16 - Flush Wood Doors.

D. Section 09 91 13 - Exterior Painting: Painting of finish carpentry items.

E. Section 09 91 23 - Interior Painting: Painting of finish carpentry items.

1.3 REFERENCE STANDARDS

A. AWI (QCP) - Quality Certification Program; Current Edition.

B. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

C. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

D. BHMA A156.9 - Cabinet Hardware; 2020.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data:

1. Provide manufacturer's product data, storage and handling instructions for factory-fabricated units.

C. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.
2. Provide the information required by AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS).
3. Include certification program label.

D. Samples: Submit two samples of finish plywood, 4 x 4 inch in size illustrating wood grain and specified finish.

E. Samples: Submit two samples of wood trim 4 inch long.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project within the past 5 years with value of woodwork within 20 percent of cost of woodwork for this project.
2. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.
3. Single Source Responsibility: Provide and install this work from single fabricator.

B. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store finish carpentry items under cover, elevated above grade, and in a dry, well-ventilated area not exposed to heat or sunlight.

B. Protect from moisture damage.

C. Handle materials and products to prevent damage to edges, ends, or surfaces.

PART 2 PRODUCTS

2.1 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Interior Woodwork Items:

1. Moldings, Bases, Casings, and Miscellaneous Trim: Clear white pine; prepare for paint finish.

2.2 LUMBER MATERIALS

A. Softwood Lumber: White Pine species, rotary sawn, maximum moisture content of 6 percent, of quality suitable for transparent finish.

2.3 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3; color as selected by Architect; textured, low gloss finish.

1. Products:

a. Basis of Design: Wilsonart VDL Laminate by Wilsonart, LLC.
b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

2.4 FASTENINGS

A. Adhesive for Purposes Other Than Laminate Installation: Suitable for the purpose; not containing formaldehyde or other volatile organic compounds.

B. Fasteners: Of size and type to suit application; galvanized finish in concealed locations and stainless steel finish in exposed locations.

C. Fasteners for Exterior Applications: Stainless steel; length required to penetrate wood substrate 1-1/2 inch minimum.

D. Concealed Joint Fasteners: Threaded steel.

2.5 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Lumber for Shimming and Blocking: Softwood lumber of Southern Pine species.

C. Primer: Alkyd primer sealer.

D. Wood Filler: Solvent base, tinted to match surface finish color.

2.6 HARDWARE

A. Hardware: Comply with BHMA A156.9.

2.7 WOOD TREATMENT

A. Redry wood after pressure treatment to maximum 15% percent moisture content.

2.8 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.

B. Cap exposed plastic laminate finish edges with material of same finish and pattern.

C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.

D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.9 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.

B. Apply wood filler in exposed nail and screw indentations.

C. On items to receive transparent finishes, use wood filler that matches surrounding surfaces and is of type recommended for the applicable finish.

D. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:

a. System - 11, Polyurethane, Catalyzed.
b. Stain: As selected by Contracting Officer.
c. Sheen: Satin.

2. Opaque:
a. System - 4, Latex Acrylic, Water-based.
b. Color: As selected by Contracting Officer.
c. Sheen: Satin.

E. Back prime woodwork items to be field finished, prior to installation.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.

B. Set and secure materials and components in place, plumb and level.

C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.2 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.

B. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.3 TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.

B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION 06 20 00

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Hardware.

C. Preparation for installing utilities.

1.2 RELATED REQUIREMENTS

A. Section 12 36 00 - Countertops.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. BHMA A156.9 - Cabinet Hardware; 2020.

D. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.

1. Scale of Drawings: 1-1/2 inch to 1 foot, minimum.

C. Product Data: Provide data for hardware accessories.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 5 years with value of woodwork within 20 percent of cost of woodwork for this Project.
2. Single Source Responsibility: Provide and install this work from single fabricator.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.7 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.1 REQUIREMENTS

A. Single Source Responsibility: Provide and install this work from single fabricator.

2.2 CABINETS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Wood Veneer Faced Cabinet:

1. Exposed Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.

C. Plastic Laminate Faced Cabinets: Custom grade.

D. Cabinets:

1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Semi-Exposed Surfaces: Decorative laminate
4. Finish - Concealed Surfaces: Manufacturer's option.
5. Casework Construction Type: Type A - Frameless.
6. Adjustable Shelf Loading: 50 lbs. per sq. ft.
7. Cabinet Style: Flush overlay.
8. Cabinet Doors and Drawer Fronts: Flush style.
9. Drawer Side Construction: Multiple-dovetailed.
10. Drawer Construction Technique: Dovetail joints.

2.3 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.4 LAMINATE MATERIALS

A. Manufacturer:

1. Basis of Design: Wilsonart LLC: www.wilsonart.com.

B. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

2.5 COUNTERTOPS

A. Countertops are specified in Section 12 36 00.

2.6 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, convex shaped; smooth finish; self locking serrated tongue; of width to match component thickness.

1. Color: As selected by Contracting Officer from manufacturer's custom range.
2. Use at all exposed plywood edges.
3. Use at all exposed shelf edges.

C. Fasteners: Size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel finish in exposed locations.

E. Grommets: Standard plastic, painted metal, or rubber grommets for cut-outs, in color to match adjacent surface.

2.7 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Drawer and Door Pulls: "U" shaped wire pull, steel with chrome finish, 4 inch centers.

C. Cabinet Locks: Keyed cylinder, two keys per lock, master keyed, steel with satin finish.

D. Catches: Magnetic.

E. Drawer Slides:

1. Type: Extension types as indicated.
2. Static Load Capacity: Heavy Duty grade.
3. Stops: Integral type.
4. Features: Provide self closing/stay closed type.
5. Manufacturers:
   a. Basis of Design: Hettich America, LP: www.hettich.com.
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

F. Hinges: European style concealed self-closing type, steel with satin finish.

1. Manufacturers:
   a. Basis of Design: Grass America Inc: www.grassusa.com.
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.8 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises.

1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
2. Cap exposed plastic laminate finish edges with material of same finish and pattern.

PART 3 EXECUTION

3.1 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use concealed joint fasteners to align and secure adjoining cabinet units.

C. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

D. Secure cabinets to floor using appropriate angles and anchorages.

3.2 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.3 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 41 00

SECTION 07 21 00 - THERMAL INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Batt insulation in exterior wall, ceiling, and roof construction.

B. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

B. Section 06 10 00 - Rough Carpentry: Supporting construction for batt insulation.

C. Section 09 21 16 - Gypsum Board Assemblies: Acoustic insulation inside walls and partitions.

1.3 REFERENCE STANDARDS

A. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

C. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. ABAA Field Quality Control Submittals: Submit third-party reports of testing and inspection required by ABAA QAP.

D. ABAA Manufacturer Qualification: Submit documentation of current evaluation of proposed manufacturer and materials.

E. ABAA Installer Qualification: Submit documentation of current contractor accreditation and current installer certification. Keep copies of contractor accreditation and installer certification on project site during and after installation. Present on-site documentation upon request.

1.5 QUALITY ASSURANCE

A. Air Barrier Association of America (ABAA) Quality Assurance Program (QAP); www.airbarrier.org/#sle:

1. Installer Qualification: Use accredited contractors, certified installers, evaluated materials, and third-party field quality control audit.
2. Manufacturer Qualification: Use evaluated materials from a single manufacturer regularly engaged in air barrier material manufacture. Use secondary materials approved in writing by primary material manufacturer.

1.6 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Thermal Insulation Manufacturers:

1. Basis of Design: Johns Manville.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 APPLICATIONS

A. Insulation in Metal Framed Walls: Batt insulation with integral vapor retarder.

B. Insulation in Wood Framed Walls: Batt insulation with integral vapor retarder.

C. Insulation Above Lay-In Acoustical Ceilings: Batt insulation with no vapor retarder.

2.3 BATT INSULATION MATERIALS

A. Where batt insulation is indicated, either glass fiber or mineral fiber batt insulation may be used, at Contractor's option.

B. Glass Fiber Batt Insulation: Flexible preformed batt or blanket, complying with ASTM C665; friction fit.

1. Flame Spread Index: 75 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 450 or less, when tested in accordance with ASTM E84.
3. Combustibility: Non-combustible, when tested in accordance with ASTM E136.
4. Thermal Resistance: R-value of 4.3 per inch.
5. Thermal Resistance: See drawings for R-value.
6. Facing: Aluminum foil, flame spread 25 rated; one side.
7. Manufacturers:
    a. Basis of Design: Johns Manville: www.jm.com.
    b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

C. Mineral Fiber Batt Insulation: Flexible or semi-rigid preformed batt or blanket, complying with ASTM C665; friction fit; unfaced flame spread index of 0 (zero) when tested in accordance with ASTM E84.

1. Flame Spread Index: 25 or less, when tested in accordance with ASTM E84.
2. Smoke Developed Index: 0 (zero), when tested in accordance with ASTM E84.
3. Thermal Resistance: R-value of 4.3 per inch.
4. Thermal Resistance: See drawings for R-value.
5. Manufacturers:
    a. Basis of Design: Johns Manville: www.jm.com.

b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.4 ACCESSORIES

A. Tape joints of rigid insulation in accordance with insulation manufacturers' instructions.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.

B. Install in exterior wall spaces without gaps or voids. Do not compress insulation.

C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.3 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 21 00

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SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fabricated sheet metal items, including flashings, counterflashings, and exterior penetrations.

B. Sealants for joints within sheet metal fabrications.

C. Precast concrete splash pads.

1.2 RELATED REQUIREMENTS

1.3 REFERENCE STANDARDS

A. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2017a.

B. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

C. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

D. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric); 2014.

E. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

F. ASTM D4586/D4586M - Standard Specification for Asphalt Roof Cement, Asbestos-Free; 2007 (Reapproved 2018).

G. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.4 PREINSTALLATION CONFERENCE

A. Preinstallation Conference: Convene one week before starting work of this section.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with SMACNA (ASMM) requirements and standard details, except as otherwise indicated.

B. Fabricator and Installer Qualifications: Company specializing in sheet metal work with 5 years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

B. Prevent contact with materials that could cause discoloration or staining.

PART 2 PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Aluminum (Salient Characteristics: ASTM B209 (ASTM B209M); 20 gage, (0.032 inch) thick; plain finish shop pre-coated with fluoropolymer coating.

1. Fluoropolymer Coating: High Performance Organic Finish, AAMA 2604; multiple coat, thermally cured fluoropolymer finish system.
2. Color: As selected by Contracting Officer from manufacturer's full colors to match existing exterior flashings.

2.2 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest possible lengths.

C. Hem exposed edges on underside 1/2 inch; miter and seam corners.

D. Form material with flat lock seams, except where otherwise indicated; at moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.

E. Fabricate corners from one piece with minimum 18 inch long legs; seam for rigidity, seal with sealant.

F. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.3 ACCESSORIES

A. Fasteners: Stainless steel, with soft neoprene washers.

B. Primer: Zinc chromate type.

C. Concealed Sealants: Non-curing butyl sealant.

D. Exposed Sealants: ASTM C920; elastomeric sealant, with minimum movement capability as recommended by manufacturer for substrates to be sealed; color to match adjacent material.

E. Plastic Cement: ASTM D4586/D4586M, Type I.

PART 3 EXECUTION

3.1 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.

B. Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil.

3.2 INSTALLATION

A. Secure flashings in place using concealed fasteners.

B. Apply plastic cement compound between metal flashings and felt flashings.

C. Fit flashings tight in place; make corners square, surfaces true and straight in planes, and lines accurate to profiles.

D. Seal metal joints watertight.

E. Slope gutters 1/4 inch per 10 feet, minimum.

F. Connect downspouts to downspout boots, and grout connection watertight.

END OF SECTION 07 62 00

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SECTION 07 92 00 - JOINT SEALANTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nonsag gunnable joint sealants.

B. Self-leveling pourable joint sealants.

C. Joint backings and accessories.

D. Government-provided field quality control.

1.2 RELATED REQUIREMENTS

A. Section 07 25 00 - Weather Barriers: Sealants required in conjunction with air barriers and vapor retarders.

B. Section 07 84 00 - Firestopping: Firestopping sealants.

C. Section 08 80 00 - Glazing: Glazing sealants and accessories.

D. Section 09 21 16 - Gypsum Board Assemblies: Sealing acoustical and sound-rated walls and ceilings.

E. Section 09 30 00 - Tiling: Sealant between tile and plumbing fixtures and at junctions with other materials and changes in plane.

1.3 REFERENCE STANDARDS

A. ASTM C661 - Standard Test Method for Indentation Hardness of Elastomeric-Type Sealants by Means of a Durometer; 2015.

B. ASTM C794 - Standard Test Method for Adhesion-In-Peel of Elastomeric Joint Sealants; 2018.

C. ASTM C834 - Standard Specification for Latex Sealants; 2017.

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2018.

E. ASTM C1087 - Standard Test Method for Determining Compatibility of Liquid-Applied Sealants with Accessories Used in Structural Glazing Systems; 2016.

F. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2016.

G. ASTM C1248 - Standard Test Method for Staining of Porous Substrate by Joint Sealants; 2018.

H. ASTM C1330 - Standard Specification for Cylindrical Sealant Backing for Use with Cold Liquid-Applied Sealants; 2018.

I. ASTM C1521 - Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints; 2019 (Reapproved 2020).

J. SCAQMD 1168 - Adhesive and Sealant Applications; 1989 (Amended 2017).

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data for Sealants: Submit manufacturer's technical data sheets for each product to be used, that includes the following.

1. Physical characteristics, including movement capability, VOC content, hardness, cure time, and color availability.
2. List of backing materials approved for use with the specific product.
3. Substrates that product is known to satisfactorily adhere to and with which it is compatible.
4. Substrates the product should not be used on.

C. Color Cards for Selection: Where sealant color is not specified, submit manufacturer's color cards showing standard colors available for selection.

D. Preconstruction Laboratory Test Reports: Submit at least four weeks prior to start of installation.

E. Preinstallation Field Adhesion Test Plan: Submit at least two weeks prior to start of installation.

F. Field Quality Control Plan: Submit at least two weeks prior to start of installation.

G. Preinstallation Field Adhesion Test Reports: Submit filled out Preinstallation Field Adhesion Test Reports log within 10 days after completion of tests; include bagged test samples and photographic records.

H. Field Quality Control Log: Submit filled out log for each length or instance of sealant installed, within 10 days after completion of inspections/tests; include bagged test samples and photographic records, if any.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing the work of this section and with at least three years of documented experience.

C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

D. Preconstruction Laboratory Testing: Arrange for sealant manufacturer(s) to test each combination of sealant, substrate, backing, and accessories.

1. Adhesion Testing: In accordance with ASTM C794.
2. Compatibility Testing: In accordance with ASTM C1087.
3. Allow sufficient time for testing to avoid delaying the work.
4. Deliver to manufacturer sufficient samples for testing.
5. Report manufacturer's recommended corrective measures, if any, including primers or techniques not indicated in product data submittals.
6. Testing is not required if sealant manufacturer provides data showing previous testing, not older than 24 months, that shows satisfactory adhesion, lack of staining, and compatibility.

E. Preinstallation Field Adhesion Test Plan: Include destructive field adhesion testing of one sample of each combination of sealant type and substrate, except interior acrylic latex sealants, and include the following for each tested sample.

1. Identification of testing agency.

2. Preinstallation Field Adhesion Test Log Form: Include the following data fields, with known information filled out.
   a. Test date.
   b. Location on project.
   c. Sealant used.
   d. Stated movement capability of sealant.
   e. Test method used.
   f. Date of installation of field sample to be tested.
   g. Date of test.
   h. Copy of test method documents.
   i. Age of sealant upon date of testing.
   j. Test results, modeled after the sample form in the test method document.
   k. Indicate use of photographic record of test.

F. Government will employ an independent testing agency to perform the field quality control inspection and testing as referenced in PART 3 of this section and as follows, to prepare and submit the field quality control plan and log, and to provide recommendations of remedies in the case of failure.

1. Contractor shall cooperate with testing agency and repair failures discovered and destructive test location damage.

G. Field Quality Control Plan:

1. Field Quality Control Log Form: Show same data fields as on Preinstallation Field Adhesion Test Log, with known information filled out and lines for multiple tests per sealant/substrate combinations; include visual inspection and specified field testing; allow for possibility that more tests than minimum specified may be necessary.

H. Field Adhesion Test Procedures:

1. Allow sealants to fully cure as recommended by manufacturer before testing.
2. Have a copy of the test method document available during tests.
3. Record the type of failure that occurred, other information required by test method, and the information required on the Field Quality Control Log.
4. When performing destructive tests, also inspect the opened joint for proper installation characteristics recommended by manufacturer, and report any deficiencies.
5. Deliver the samples removed during destructive tests in separate sealed plastic bags, identified with project, location, test date, and test results, to Government.
6. If any combination of sealant type and substrate does not show evidence of minimum adhesion or shows cohesion failure before minimum adhesion, report results to Contracting Officer.

I. Destructive Field Adhesion Test: Test for adhesion in accordance with ASTM C1521, using Destructive Tail Procedure.

1. Sample: At least 18 inches long.
2. Minimum Elongation Without Adhesive Failure: Consider the tail at rest, not under any elongation stress; multiply the stated movement capability of the sealant in percent by

two; then multiply 1 inch by that percentage; if adhesion failure occurs before the "1 inch mark" is that distance from the substrate, the test has failed.

3. If either adhesive or cohesive failure occurs prior to minimum elongation, take necessary measures to correct conditions and re-test; record each modification to products or installation procedures.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion.

C. Warranty: Include coverage for installed sealants and accessories that fail to achieve watertight seal , exhibit loss of adhesion or cohesion, or do not cure.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Non-Sag Sealants: Permits application in joints on vertical surfaces without sagging or slumping.

1. Basis of Design: Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Self-Leveling Sealants: Pourable or self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.

1. Basis of Design: Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html/#sle.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 JOINT SEALANT APPLICATIONS

A. Scope:

1. Exterior Joints: Seal open joints, whether or not the joint is indicated on drawings, unless specifically indicated not to be sealed. Exterior joints to be sealed include, but are not limited to, the following items.
   a. Wall expansion and control joints.
   b. Joints between door, window, and other frames and adjacent construction.
   c. Joints between different exposed materials.
   d. Openings below ledge angles in masonry.
   e. Other joints indicated below.
2. Interior Joints: Do not seal interior joints unless specifically indicated to be sealed. Interior joints to be sealed include, but are not limited to, the following items.
   a. Joints between door, window, and other frames and adjacent construction.
   b. Other joints indicated below.

3. Do not seal the following types of joints.
    a. Intentional weepholes in masonry.
    b. Joints indicated to be treated with manufactured expansion joint cover or some other type of sealing device.
    c. Joints where sealant is specified to be provided by manufacturer of product to be sealed.
    d. Joints where installation of sealant is specified in another section.
    e. Joints between suspended panel ceilings/grid and walls.

B. Interior Wet Areas: Bathrooms, restrooms, and kitchens; fixtures in wet areas include plumbing fixtures, countertops, and cabinets. Use mildew-resistant silicone sealant, unless otherwise indicated.

C. Joints between exterior sheathing panels: Use multi-part, non-sag polyurethane sealant, unless otherwise indicated.

D. Exterior joints in masonry, including expansion/control joints: Use low modulus silicone sealant, unless otherwise indicated.

E. Exterior and interior joints at perimeter of windows/storefront: Medium modulus silicone sealant, unless otherwise indicated.

F. Joints at perimeter of hollow metal framing: Medium modulus silicone sealant, unless otherwise indicated.

G. Exterior joints between wall finish and conduit & pipe penetrations, base plates of light fixtures, signage supports and other items applied to exterior wall surface: Medium modulus silicone sealant, unless otherwise indicated.

H. Interior concealed bedding joints and thresholds: Acrylic sealant, unless otherwise indicated.

I. Exterior and interior horizontal traffic-bearing joints, excluding tile floor joints: Two-part polyurethane sealant, unless otherwise indicated.

J. Tile expansion and control joint sealant: Refer to Tiling section.

K. Fire stopped joints: Firestop sealant as specified in Firestopping section.

2.3 JOINT SEALANTS - GENERAL

A. Sealants and Primers: Provide products having lower volatile organic compound (VOC) content than indicated in SCAQMD 1168.

2.4 NONSAG JOINT SEALANTS

A. Non-Staining Silicone Sealant: ASTM C920, Grade NS, Uses M and A; not expected to withstand continuous water immersion or traffic. See below for salient characteristics.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Non-Staining To Porous Stone: Non-staining to light-colored natural stone when tested in accordance with ASTM C1248.
3. Dirt Pick-Up: Reduced dirt pick-up compared to other silicone sealants.
4. Hardness Range: 15 to 40, Shore A, when tested in accordance with ASTM C661.
5. Color: To be selected by Contracting Officer from manufacturer's standard range.
6. Manufacturers:

a. Basis of Design: Dow Chemical Company: consumer.dow.com/en-us/industry/ind-building-construction.html; Low modulus silicone sealant.
b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Mildew-Resistant Silicone Sealant: ASTM C920, Grade NS, Uses M and A; single component, mildew resistant; not expected to withstand continuous water immersion or traffic. See below for salient characteristics.

1. Color: To be selected by Architect from manufacturer's standard range.
2. Manufacturers:
a. Basis of Design: Dow Chemical Company; DOWSIL 786 Silicone Sealant: consumer.dow.com/en-us/industry/ind-building-construction.html.
b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

C. Polyurethane Sealant: ASTM C920, Grade NS, Uses M and A; multi-component; not expected to withstand continuous water immersion or traffic. See below for salient characteristics.

1. Movement Capability: Plus and minus 50 percent, minimum.
2. Hardness Range: 20 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Contracting Officer from manufacturer's standard range.
4. Service Temperature Range: Minus 40 to 180 degrees F.
5. Manufacturers:
a. Basis of Design: Tremco Commercial Sealants & Waterproofing; Dymeric 240 FC: www.tremcosealants.com.
b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

D. Acrylic Emulsion Latex: Water-based; ASTM C834, single component, non-staining, non-bleeding, non-sagging; paintable; not intended for exterior use. See below for salient characteristics.

1. Color: To be selected by Contracting Officer from manufacturer's standard range.
2. Grade: ASTM C834; Grade Minus 18 Degrees C (0 Degrees F).

2.5 SELF-LEVELING SEALANTS

A. Self-Leveling Polyurethane Sealant for Horizontal Expansion Joints: ASTM C920, Grade P, Uses T, M and O; multi-component; explicitly approved by manufacturer for horizontal expansion joints. See below for salient characteristics.

1. Movement Capability: Plus and minus 25 percent, minimum.
2. Hardness Range: 30 to 35, Shore A, when tested in accordance with ASTM C661.
3. Color: To be selected by Contracting Officer from manufacturer's standard range.

2.6 ACCESSORIES

A. Backer Rod (Salient Characteristics): Cylindrical cellular foam rod with surface that sealant will not adhere to, compatible with specific sealant used, and recommended by backing and sealant manufacturers for specific application.

1. Type for Joints Not Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type O - Open Cell Polyurethane.
2. Type for Joints Subject to Pedestrian or Vehicular Traffic: ASTM C1330; Type B - Bi-Cellular Polyethylene.
3. Open Cell: 40 to 50 percent larger in diameter than joint width.
4. Closed Cell and Bi-Cellular: 25 to 33 percent larger in diameter than joint width.

B. Backing Tape (Salient Characteristics): Self-adhesive polyethylene tape with surface that sealant will not adhere to and recommended by tape and sealant manufacturers for specific application.

C. Masking Tape (Salient Characteristics): Self-adhesive, nonabsorbent, non-staining, removable without adhesive residue, and compatible with surfaces adjacent to joints and sealants.

D. Joint Cleaner (Salient Characteristics): Non-corrosive and non-staining type, type recommended by sealant manufacturer; compatible with joint forming materials.

E. Primers (Salient Characteristics): Type recommended by sealant manufacturer to suit application; non-staining.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that joints are ready to receive work.

B. Verify that backing materials are compatible with sealants.

C. Verify that backer rods are of the correct size.

D. Preinstallation Adhesion Testing: Install a sample for each test location indicated in the test plan.

1. Test each sample as specified in PART 1 under QUALITY ASSURANCE article.
2. Notify Contracting Officer of date and time that tests will be performed, at least seven days in advance.
3. Record each test on Preinstallation Adhesion Test Log as indicated.
4. If any sample fails, review products and installation procedures, consult manufacturer, or take whatever other measures are necessary to ensure adhesion; re-test in a different location; if unable to obtain satisfactory adhesion, report to Contracting Officer.
5. After completion of tests, remove remaining sample material and prepare joint for new sealant installation.

3.2 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean joints, and prime as necessary, in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Mask elements and surfaces adjacent to joints from damage and disfigurement due to sealant work; be aware that sealant drips and smears may not be completely removable.

3.3 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

D. Install bond breaker backing tape where backer rod cannot be used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags, and without getting sealant on adjacent surfaces.

F. Do not install sealant when ambient temperature is outside manufacturer's recommended temperature range, or will be outside that range during the entire curing period, unless manufacturer's approval is obtained and instructions are followed.

G. Nonsag Sealants: Tool surface concave, unless otherwise indicated; remove masking tape immediately after tooling sealant surface.

3.4 FIELD QUALITY CONTROL

A. Government will employ an independent testing agency to perform field quality control inspection and testing as specified in PART 1 under QUALITY ASSURANCE article.

B. Remove and replace failed portions of sealants using same materials and procedures as indicated for original installation.

END OF SECTION 07 92 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Non-fire-rated hollow metal doors and frames.

B. Hollow metal frames for wood doors.

C. Thermally insulated hollow metal doors with frames.

1.2 RELATED REQUIREMENTS

A. Section 08 71 00 - Door Hardware.

B. Section 09 91 13 - Exterior Painting: Field painting.

C. Section 09 91 23 - Interior Painting: Field painting.

1.3 ABBREVIATIONS AND ACRONYMS

A. NFPA: National Fire Protection Association.

B. SDI: Steel Door Institute.

C. UL: Underwriters Laboratories.

1.4 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2011.

C. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames; 2003 (R2009).

D. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

E. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2011.

F. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

G. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.

H. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

I. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2020.

J. ASTM C476 - Standard Specification for Grout for Masonry; 2020.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

L. BHMA A156.115 - American National Standard for Hardware Preparation in Steel Doors and Steel Frames; 2016.

M. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

N. NAAMM HMMA 830 - Hardware Selection for Hollow Metal Doors and Frames; 2002.

O. NAAMM HMMA 831 - Hardware Locations for Hollow Metal Doors and Frames; 2011.

P. NAAMM HMMA 840 - Guide Specifications For Receipt, Storage and Installation of Hollow Metal Doors and Frames; 2007.

Q. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; 2014.

R. SDI 117 - Manufacturing Tolerances for Standard Steel Doors and Frames; 2013.

1.5 SUBMITTALS

A. See Section 013323 - Submittal Procedures, for submittal procedures.

B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.

C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and any indicated finish requirements.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide hollow metal doors and frames from SDI Certified manufacturer.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Maintain at project site copies of reference standards relating to installation of products specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with NAAMM HMMA 840 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.

B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion and adverse effects on factory applied painted finish.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors and Frames:

1. Basis of Design: Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Hurricane-Resistant Hollow Metal Doors and Frames:

1. Basis of Design: Ceco Door, an Assa Abloy Group company: www.assaabloydss.com.

2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 PERFORMANCE REQUIREMENTS

A. Salient Requirements for Hollow Metal Doors and Frames:

1. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
2. Accessibility: Comply with ICC A117.1 and ADA Standards.
3. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
4. Hardware Preparations, Selections and Locations: Comply with NAAMM HMMA 830 and NAAMM HMMA 831 or BHMA A156.115 and ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
5. Zinc Coating for Typical Interior and/or Exterior Locations: Provide metal components zinc-coated (galvanized) and/or zinc-iron alloy-coated (galvannealed) by the hot-dip process in accordance with ASTM A653/A653M, with manufacturer's standard coating thickness, unless noted otherwise for specific hollow metal doors and frames.
    a. Based on SDI Standards: Provide at least A40/ZF120 (galvannealed) when necessary, coating not required for typical interior door applications, and at least A60/ZF180 (galvannealed) for corrosive locations.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 HOLLOW METAL DOORS

A. See below for salient characteristics.

B. Door Finish: Factory primed and field finished.

C. Exterior Doors: Thermally insulated.

1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
    a. Level 3 - Extra Heavy-duty.
    b. Physical Performance Level B, 500,000 cycles; in accordance with ANSI/SDI A250.4.
    c. Model 1 - Full Flush.
    d. Door Face Metal Thickness: 14 gauge, 0.067 inch, minimum.
2. Door Core Material: Polyurethane, 1.8 lbs/cu ft minimum density.
    a. Foam Plastic Insulation: Manufacturer's standard board insulation with maximum flame spread index (FSI) of 75, and maximum smoke developed index (SDI) of 450 in accordance with ASTM E84, and completely enclosed within interior of door.

3. Door Thermal Resistance: R-Value of 8.7, minimum, for installed thickness of polyurethane.
4. Door Thickness: 1-3/4 inches, nominal.
5. Top Closures for Outswinging Doors: Flush with top of faces and edges.
6. Door Face Sheets: Flush.
7. Weatherstripping: Refer to Section 08 71 00.

2.4 HOLLOW METAL FRAMES

A. See below for salient characteristics.

B. Comply with standards and/or custom guidelines as indicated for corresponding door in accordance with applicable door frame requirements.

C. Exterior Door Frames: Full profile/continuously welded type.

1. Galvanizing: Components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A653/A653M, with A60/ZF180 coating.
2. Frame Metal Thickness: 14 gage, 0.067 inch, minimum.
3. Frame Finish: Factory primed and field finished.
4. Weatherstripping: Separate, see Section 08 71 00.

D. Interior Door Frames, Non-Fire Rated: Full profile/continuously welded type.

1. Frame Metal Thickness: 16 gage, 0.053 inch, minimum.
2. Frame Finish: Factory primed and field finished.

E. Frames for Wood Doors: Comply with frame requirements in accordance with corresponding door.

F. Borrowed Lites Glazing Frames: Construction and face dimensions to match door frames, and as indicated on drawings.

G. Frames Wider than 48 inches: Reinforce with steel channel fitted tightly into frame head, flush with top.

2.5 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

B. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15 mil, 0.015 inch dry film thickness (DFT) per coat; provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 ACCESSORIES

A. Glazing: As specified in Section 08 80 00, factory installed.

B. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.

C. Grout for Frames: Mortar grout complying with ASTM C476 with maximum slump of 4 inches as measured in accordance with ASTM C143/C143M for hand troweling in place; plaster grout and thinner pumpable grout are prohibited.

D. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

E. Temporary Frame Spreaders: Provide for factory- or shop-assembled frames.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Verify that finished walls are in plane to ensure proper door alignment.

3.2 PREPARATION

A. Coat inside of frames to be installed in masonry or to be grouted, with bituminous coating, prior to installation.

3.3 INSTALLATION

A. Install doors and frames in accordance with manufacturer's instructions and related requirements of specified door and frame standards or custom guidelines indicated.

B. Coordinate frame anchor placement with wall construction.

C. Grout frames in masonry construction, using hand trowel methods; brace frames so that pressure of grout before setting will not deform frames.

D. Install door hardware as specified in Section 08 71 00.

1. Comply with recommended practice for hardware placement of doors and frames in accordance with ANSI/SDI A250.6 or NAAMM HMMA 861.

E. Comply with glazing installation requirements of Section 08 80 00.

F. Coordinate installation of electrical connections to electrical hardware items.

G. Touch up damaged factory finishes.

3.4 TOLERANCES

A. Clearances Between Door and Frame: Comply with related requirements of specified frame standards or custom guidelines indicated in accordance with SDI 117 or NAAMM HMMA 861.

B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

END OF SECTION 08 11 13

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.2 RELATED REQUIREMENTS

A. Section 08 11 13 - Hollow Metal Doors and Frames.

B. Section 08 71 00 - Door Hardware.

C. Section 08 80 00 - Glazing.

D. Section 09 91 23 - Interior Painting: Field finishing of doors.

1.3 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Warranty, executed in Government's name.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.

1. Company with at least one project within past five years with value of woodwork within at least 20 percent of cost of woodwork for this project.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging, and inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.7 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Wood Veneer Faced Doors:

1. Basis of Design: Haley Brothers: www.haleybros.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 DOORS

A. Doors: See drawings for locations and additional requirements.

1. Quality Standard: Custom Grade, Heavy Duty performance, in accordance with AWI/AWMAC/WI (AWS), unless noted otherwise.
2. Wood Veneer Faced Doors: 5-ply unless otherwise indicated.

B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.

1. Provide solid core doors at each location.
2. Wood veneer facing for field opaque finish to match existing doors (in same building).

2.3 DOOR AND PANEL CORES

2.4 DOOR FACINGS

A. Veneer Facing for Transparent Finish (Salient Characteristics): Cherry, veneer grade in accordance with quality standard indicated, plain sliced (flat cut), with book match between leaves of veneer, running match of spliced veneer leaves assembled on door or panel face.

1. Vertical Edges: Any option allowed by quality standard for grade.
2. "Running Match" each pair of doors and doors in close proximity to each other.
3. "Pair Match" each pair of doors; "Set Match" pairs of doors within 10 feet of each other when doors are closed.

B. Veneer Facing for Opaque Finish (Salient Characteristics): Medium density overlay (MDO), in compliance with indicated quality standard.

C. Facing Adhesive: Type I - waterproof.

2.5 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.

B. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.

C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.

D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.

1. Exception: Doors to be field finished.

E. Provide edge clearances in accordance with the quality standard specified.

2.6 FINISHES - WOOD VENEER DOORS

A. See below for salient characteristics.

B. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:

1. Transparent:
   a. System - 11, Polyurethane, Catalyzed.
   b. Stain: Match existing doors. To be selected by Contracting Officer.
   c. Sheen: Satin.
2. Opaque:
   a. System - 4, Latex Acrylic, Water-based.
   b. Color: Match existing doors. To be selected by Contracting Officer.
   c. Sheen: Satin.

C. Seal door top edge with color sealer to match door facing.

2.7 ACCESSORIES

A. Hollow Metal Door Frames: See Section 08 11 13.

B. Glazing: See Section 08 80 00.

C. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

D. Door Hardware: See Section 08 71 00.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Use machine tools to cut or drill for hardware.

D. Coordinate installation of doors with installation of frames and hardware.

E. Coordinate installation of glazing.

3.3 TOLERANCES

A. Comply with specified quality standard for fit and clearance tolerances.

B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

END OF SECTION 08 14 16

SECTION 08 43 13 - ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.2 RELATED REQUIREMENTS

A. Section 08 80 00 - Glazing: Glass and glazing accessories.

1.3 REFERENCE STANDARDS

A. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; 2015.

B. AAMA 609 & 610 - Cleaning and Maintenance Guide for Architecturally Finished Aluminum (Combined Document); 2015.

C. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

D. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

E. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

F. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

G. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

H. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2016).

I. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

B. Preinstallation Conference: Conduct a preinstallation conference one week before starting work of this section; require attendance by all affected installers.

1.5 SUBMITTALS

A. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.

B. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related work, expansion and contraction joint location and details, and field welding required.

1. Include design engineer's stamp or seal on shop drawings for attachments and anchors.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience and approved by manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.8 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F. Maintain this minimum temperature during and 48 hours after installation.

1.9 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data, for additional warranty requirements.

B. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.

C. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.1 FRAMING FOR INSULATING GLAZING

A. Center-Set Style, Wind-Borne-Debris Resistance Tested:

2.2 SWINGING DOORS

A. Medium Stile, Insulating Glazing, Thermally-Broken:

1. Basis of Design: Kawneer North America; AA425 Thermal Entrance: www.kawneer.com
2. Thickness: 2-1/4 inches.

B. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.3 ALUMINUM-FRAMED STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.

B. See below for salient characteristics.

1. Finish: Class I natural anodized.

a. Factory finish all surfaces that will be exposed in completed assemblies.

2. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
3. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
4. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
5. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
6. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
7. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.
8. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glazing and heel bead of glazing compound.
9. Preparation for Window Treatments: Provide reinforced interior horizontal head rail.

C. Performance Requirements:

1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
   a. Design Wind Loads: Comply with requirements of applicable code.
   b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
2. Wind-Borne-Debris Resistance: Identical full-size glazed assembly without auxiliary protection, having Florida Building Code FLA (PAD) approval for Large and Small Missile impact and pressure cycling at design wind pressure.
3. Water Penetration Resistance on Manufactured Assembly: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf.
4. Air Leakage Laboratory Test: Maximum of 0.06 cu ft/min sq ft of wall area, when tested in accordance with ASTM E283 at 6.27 psf pressure differential across assembly.

2.4 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sections, drainage holes and internal weep drainage system. See below for salient characteristics.

1. Framing members for interior applications need not be thermally broken.
2. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 80 00.

C. Swing Doors: Glazed aluminum.

1. Thickness: 1-3/4 inches.
2. Top Rail: 4 1/4 inches wide.
3. Bottom Rail: 6 1/2 inches wide.
4. Glazing Stops: Square.
5. Finish: Same as storefront.

2.5 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Exposed Flashings: Aluminum sheet, 20 gauge, 0.032 inch minimum thickness; finish to match framing members.

D. Concealed Flashings: Sheet aluminum, 26 gauge, 0.017 inch minimum thickness.

E. Sill Flashing Sealant: Elastomeric, silicone or polyurethane, compatible with flashing material.

F. Sealant for Setting Thresholds: Non-curing butyl type.

G. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

H. Glazing Accessories: As specified in Section 08 80 00.

2.6 FINISHES

A. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils thick.

2.7 HARDWARE

A. Weatherstripping: Wool pile, continuous and replaceable; provide on all doors.

B. Sill Sweep Strips: Resilient seal type, retracting, of neoprene; provide on all doors.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.2 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Install hardware using templates provided.

J. Install glass in accordance with Section 08 80 00, using glazing method required to achieve performance criteria.

K. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

3.3 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inch per 3 feet non-cumulative or 0.06 inch per 10 feet, whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

3.4 ADJUSTING

A. Adjust operating hardware for smooth operation.

3.5 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths, and take care to remove dirt from corners and to wipe surfaces clean.

C. Upon completion of installation, thoroughly clean aluminum surfaces in accordance with AAMA 609 & 610.

3.6 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 43 13

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SECTION 08 51 23 - STEEL WINDOWS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Factory finished steel windows with fixed and operating sash.

B. Factory-installed glazing .

C. Operating hardware and framed insect screens.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealing joints between frames and adjacent construction.

B. Section 08 80 00 - Glazing.

1.3 REFERENCE STANDARDS

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide component dimensions, fasteners, anchors, glass, and Caul.

C. Shop Drawings: Indicate opening dimensions, framed opening tolerances, affected related work; installation requirements.

D. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Government's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing windows specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect factory finished surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond when exposed to sunlight or weather.

1.7 FIELD CONDITIONS

A. Do not install sealants when ambient temperature is less than 40 degrees F.

B. Maintain this minimum temperature during and after installation of sealants.

1.8 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Provide five year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 PRODUCTS

2.1 STEEL WINDOWS

A. Steel Windows: Hot rolled steel sections, factory fabricated, factory finished, with vision glass, infill panels, related flashings, anchorage and attachment devices.

2.2 FABRICATION

A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.

B. Accurately fit and secure joints and corners. Make joints flush and hairline.

C. Arrange fasteners to conceal from view.

2.3 FINISHES

A. Window Frames: Baked enamel finish.

B. Screens: Black color.

END OF SECTION 08 51 23

SECTION 08 71 00 - DOOR HARDWARE

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ANSI/SDI A250.8 - Specifications for Standard Steel Doors and Frames (SDI-100); 2017.

B. BHMA A156.1 - American National Standard for Butts and Hinges; 2016.

C. BHMA A156.4 - American National Standard for Door Controls - Closers; 2013.

D. BHMA A156.5 - American National Standard for Cylinders and Input Devices for Locks; 2014.

E. BHMA A156.13 - American National Standard for Mortise Locks & Latches Series 1000; 2017.

F. BHMA A156.26 - American National Standard for Continuous Hinges; 2017.

G. BHMA A156.28 - Standard for Recommended Practices for Mechanical Keying Systems; 2023.

H. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2024.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2019.

K. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. NFPA 105 - Standard for Smoke Door Assemblies and Other Opening Protectives; 2019.

M. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2017.

N. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

O. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

P. UL 305 - Standard for Panic Hardware; Current Edition, Including All Revisions.

Q. UL 1784 - Standard for Air Leakage Tests of Door Assemblies; Current Edition, Including All Revisions.

R. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

1.2 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage

4. Toilet accessories
5. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section "Rough Carpentry"
3. Division 06 Section "Finish Carpentry"
4. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Flush Wood Doors"
   c. "Stile and Rail Wood Doors"
   d. "Interior Aluminum Doors and Frames"
   e. "Aluminum-Framed Entrances and Storefronts"
   f. "Stainless Steel Doors and Frames"
   g. "Special Function Doors"
   h. "Entrances"
6. Division 26 feet'Electrical" sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 feet'Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

1.3 REFERENCES

A. UL LLC

1. UL 10B - Fire Test of Door Assemblies
2. UL 10C - Positive Pressure Test of Fire Door Assemblies
3. UL 1784 - Air Leakage Tests of Door Assemblies
4. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code
2. NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
3. NFPA 101 – Life Safety Code
4. NFPA 105 – Smoke and Draft Control Door Assemblies
5. NFPA 252 – Fire Tests of Door Assemblies

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities

2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
5. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.4 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   b. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.
3. Samples for Verification: If requested by Contracting Officer, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Contracting Officer may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:

1) Door Index: door number, heading number, and Contracting Officer hardware set number.
2) Quantity, type, style, function, size, and finish of each hardware item.
3) Name and manufacturer of each item.
4) Fastenings and other pertinent information.
5) Location of each hardware set cross-referenced to indications on Drawings.
6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Government, by means as directed by Government.
   f. Prepare key schedule by or under supervision of supplier, detailing Government's final keying instructions for locks.

C. Informational Submittals:
   1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
   2. Provide Product Data:
      a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
      b. Include warranties for specified door hardware.

D. Closeout Submittals:
   1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
      a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
      b. Catalog pages for each product.
      c. Final approved hardware schedule edited to reflect conditions as installed.
      d. Final keying schedule

e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

E. Inspection and Testing:

1. Submit written reports to the Government and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
   a. Fire door assemblies, in compliance with NFPA 80.
   b. Required egress door assemblies, in compliance with NFPA 101.

1.5 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Government, Contracting Officer, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   a. For door hardware: DHI certified AHC or DHC.
   b. Can provide installation and technical data to Contracting Officer and other related subcontractors.
   c. Can inspect and verify components are in working order upon completion of installation.
   d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Contracting Officer.
4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Fire-Rated Door Openings:
   a. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of Authority Having Jurisdiction (AHJ).
   b. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to Authority Having Jurisdiction (AHJ) for use on types and sizes of doors indicated,

based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

2. Smoke and Draft Control Door Assemblies:
   a. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
   b. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.
3. Electrified Door Hardware
   a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to Authority Having Jurisdiction (AHJ).
4. Accessibility Requirements:
   a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
   a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      2) Preliminary key system schematic diagram.
      3) Requirements for key control system.
      4) Requirements for access control.
      5) Address for delivery of keys.
2. Pre-installation Conference
   a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Inspect and discuss preparatory work performed by other trades.
   c. Inspect and discuss electrical roughing-in for electrified door hardware.
   d. Review sequence of operation for each type of electrified door hardware.
   e. Review required testing, inspecting, and certifying procedures.
   f. Review questions or concerns related to proper installation and adjustment of door hardware.
3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

F. Deliver keys to manufacturer of key control system for subsequent delivery to Government.

1.7 COORDINATION

A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Security: Coordinate installation of door hardware, keying, and access control with Government 's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

1.8 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
   a. Mechanical Warranty
      1) Locks:10 years
      2) Exit Devices: 10 years
      3) Closers: 10 years

1.9 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Government for maintenance purposes.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. The Government requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

B. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Contracting Officer approval.

2.2 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Contracting Officer where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.

3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product (Basis of Design): Ives 5BB series
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. 1-3/4 inch thick doors, up to and including 36 inches wide:
   a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches high
   b. Interior: Standard weight, steel, 4-1/2 inches high
4. 1-3/4 inch thick doors over 36 inches wide:
   a. Exterior: Heavy weight, bronze/stainless steel, 5 inches high
   b. Interior: Heavy weight, steel, 5 inches high
5. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
6. Provide three hinges per door leaf for doors 90 inches or less in height, and one additional hinge for each 30 inches of additional door height.
7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins
8. Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

2.4 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives XY series
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.

2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. On fire-rated doors, provide aluminum geared continuous hinges classified for use on rated doors by testing agency acceptable to Authority Having Jurisdiction (AHJ).
6. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
7. Provide hinges 1 inch shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.5 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product (Basis of Design): Schlage L9000 series
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Indicators: Where specified, provide indicator window measuring a minimum 2-inch x 1/2 inch with 180-degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
5. Provide locks with standard 2-3/4 inches backset with full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (0.98 inch) throw, constructed of stainless steel.
6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches. Provide motor based electrified and motor based latch retraction locksets that comply with the following requirements:
    a. Universal input voltage – single chassis accepts 12 or 24VDC to allow for changes in the field without changing lock chassis.
    b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
    c. Low maximum current draw – maximum 0.4 amps (Lever control) and maximum 2.0 amps (Latch retraction) to allow for multiple locks on a single power supply.

d. Low holding current (Lever control or latch retraction) – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications and motorized latch retraction applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
e. Connections – provide quick-connect Molex system standard.

8. (OPTION Key Override) Provide locks with a key override feature built into the chassis that allows the outside key to retract the deadbolt and/or latchbolt, overriding the inside thumbturn when it is being held in the locked position - where the XL13-439 option is specified in the hardware sets.
9. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

2.6 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product (Basis of Design): Falcon MA series
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to "KEYING" article, herein.
4. Provide locks with standard 2-3/4 inches backset with full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (0.98 inch) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide a request to exit (RX) switch that is actuated with rotation of inside lever.
7. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
   a. Sutro (SN)

2.7 MORTISE LOCKS – NARROW STYLE

A. Manufacturer and Product:

1. Scheduled Manufacturer (Basis of Design):
   a. Accurate

B. Requirements:

1. Provide narrow style mortise locks conforming to ANSI/BHMA A156.13, Grade 1 Operational and manufactured from heavy gauge steel, containing components of steel with zinc dichromate plating for corrosion resistance. Cylinders: Refer to "KEYING" article, herein.
2. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
3. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets.
4. Lever Trim: Matching levers and roses or escutcheons from manufacturer of standard mortise locks. Provide all necessary fasteners, spindles, and parts to make complete functioning unit.
    a. Provide levers that return to within 1/2 inch of door face.

2.8 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product (Basis of Design): BEST SFIC
2. This is sole source, no substitutions allowed.

B. Requirements:

1. Provide cylinders/cores to match Government’s existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer’s series as indicated. Refer to “KEYING” article, herein.

2.9 KEYING

A. Scheduled System:

1. Existing factory registered system:
    a. Provide cylinders/cores keyed into Government’s existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
    a. Replaceable Construction Cores.
        1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
            (a) 3 construction control keys
            (b) 12 construction change (day) keys.
        2) Government or Government’s Representative will replace temporary construction cores with permanent cores.
2. Permanent Keying:
    a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
        1) Master Keying system as directed by the Government.
    b. Forward bitting list and keys separately from cylinders, by means as directed by Government. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Government.

c. Provide keys with the following features:
   1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
   2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   3) Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

d. Identification:
   1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
   2) Identification stamping provisions must be approved by the Contracting Officer and Government.
   3) Stamp cylinders/cores and keys with Government's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
   4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Government.
   5) Forward permanent cylinders/cores to Government, separately from keys, by means as directed by Government.

e. Quantity: Furnish in the following quantities.
   1) Permanent Control Keys: 3.
   2) Master Keys: 6.
   3) Change (Day) Keys: 3 per cylinder/core that is keyed differently
   4) Key Blanks: Quantity as determined in the keying meeting.

2.10 KEY CONTROL SYSTEM

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Telkee
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Requirements:

1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
   a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
   b. Provide hinged-panel type cabinet for wall mounting.

2.11 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product (Basis of Design):
   a. Falcon SC80A series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory.
2. Provide door closers with fully hydraulic, full rack and pinion action with aluminum cylinder.
3. Closer Body: 1-1/4-inch 1.26 inch diameter, with 5/8-inch (0.63 inch) diameter heat-treated pinion journal.
4. Hydraulic Fluid: Fireproof, passing requirements of UL 10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees Fahrenheit to -30 degrees Fahrenheit.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
7. Pressure Relief Valve (PRV) Technology: Not permitted.
8. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.13 PROTECTION PLATES

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide protection plates with a minimum of 0.050 inch thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2. Sizes plates 2 inches less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch less width of door on pairs without a mullion or edge guards.
3. At fire rated doors, provide protection plates over 16 inches high with UL label.

2.14 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers (Basis of Design): Glynn-Johnson
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

2.15 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2. Where a wall stop cannot be used, provide universal floor stops.
3. Where wall or floor stop cannot be used, provide overhead stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.16 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Zero International
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
4. Size thresholds 1/2 inch high by 5 inches wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

2.17 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.18 COAT HOOKS

A. Manufacturers:

1. Scheduled Manufacturer (Basis of Design): Ives
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Provide coat hooks as specified.

2.19 FINISHES

A. FINISH: BHMA 626/652 (US26D); EXCEPT:

1. Hinges at Exterior Doors: BHMA 630 (US32D)
2. Aluminum Geared Continuous Hinges: BHMA 628 (US28)
3. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
4. Protection Plates: BHMA 630 (US32D)
5. Overhead Stops and Holders: BHMA 630 (US32D)
6. Door Closers: Powder Coat to Match
7. Wall Stops: BHMA 630 (US32D)
8. Latch Protectors: BHMA 630 (US32D)
9. Weatherstripping: Clear Anodized Aluminum
10. Thresholds: Mill Finish Aluminum

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
4. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Government for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Contracting Officer.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Contracting Officer's opening number.

K. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

L. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

M. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Contracting Officer.

N. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

R. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.3 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: Adjust sweep period to comply with accessibility requirements and requirements of Authority Having Jurisdiction (AHJ).

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer's instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a

hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

137809 OPT0441538 VERSION 5

A. Legend:

1. ~ Electrified Opening
2. MFR = Manufacturer
   a. ACC = Accurate Lock & Hardware (Basis of Design)
   b. BES = Best SFIC (Basis of Design)
   c. B/O = By Others (Not Manufacturer Specific)
   d. FAL = Falcon MA Series (Basis of Design)
   e. GLY = Glynn Johnson (Basis of Design)
   f. IVE = Ives 5BB Series (Basis of Design)
   g. ZER = Zero International (Basis of Design)

HARDWARE GROUP NO. 01 - MUD RM

FOR USE ON DOOR #(S):

112

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	ENTRY / OFFICE LOCK	MA541H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	SURFACE CLOSER	SC81A SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)	AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)	AA	ZER
1	EA	RAIN DRIP SWEEP	8197AA (SIZE AS REQ'D)	AA	ZER
1	EA	THRESHOLD	65A (SIZE AS REQ'D)	A	ZER

HARDWARE GROUP NO. 10 - OPEN WORKROOM

FOR USE ON DOOR #(S):

115

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PASSAGE SET	MA101 SN	626	FAL
1	EA	SURFACE CLOSER	SC81A HDPA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 11 - CLASSROOM

FOR USE ON DOOR #(S):

108

PROVIDE EACH PR DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CYL X TURN DEAD LOCK	L460HD 09-544	626	SCH
1	EA	MORTISE THUMBTURN	985T	626	FAL
1	EA	SFIC MORTISE HOUSING	C987	630	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
2	EA	PUSH/PULL BAR	9190EZHD-10"-NS	630-316	IVE
2	EA	SURFACE CLOSER	SC81A SS	689	FAL
2	EA	CUSH SHOE SUPPORT	SC80A-30 (AS REQ'D)	689	FAL
2	EA	BLADE STOP SPACER	SC80A-61 (AS REQ'D)	689	FAL
1	EA	GASKETING	PROVIDED BY DOOR SUPPLIER		B/O
2	EA	DOOR SWEEP	PROVIDED BY DOOR SUPPLIER		B/O

HARDWARE GROUP NO. 40 - LACTATION

FOR USE ON DOOR #(S):

112 118

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	MA301 OCCUPIED/VACANT SNM	626	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)	BK	ZER
1	EA	COAT AND HAT HOOK	571	626	IVE

HARDWARE GROUP NO. 41 - SHOWER

FOR USE ON DOOR #(S):

114

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	MA301 OCCUPIED/VACANT SNM	626	FAL
1	EA	SURFACE CLOSER	SC81A SS	689	FAL
1	EA	COAT AND HAT HOOK	571	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 42 - RESTROOM

FOR USE ON DOOR #(S):

113

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	PRIVACY LOCK	MA301 OCCUPIED/VACANT SNM	626	FAL
1	EA	SURFACE CLOSER	SC81A SS	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)	BK	ZER
1	EA	COAT AND HAT HOOK	571	626	IVE

HARDWARE GROUP NO. 43 - LACTATION

FOR USE ON DOOR #(S):

121

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	APARMENT CORRDR LOCK	MA531H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	SURFACE CLOSER	SC81A REG	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	8303AA (SIZE AS REQ'D)	AA	ZER
1	EA	RAIN DRIP SWEEP	8197AA (SIZE AS REQ'D)	AA	ZER
1	EA	THRESHOLD	65A (SIZE AS REQ'D)	A	ZER

HARDWARE GROUP NO. 50 - OFFICES

FOR USE ON DOOR #(S):

103 104 119 120

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRY / OFFICE LOCK	MA541H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 51 - ADMIN

FOR USE ON DOOR #(S):

101

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	ENTRY / OFFICE LOCK	MA541H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	SURFACE CLOSER	SC81A REG	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS439	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 70 - CLASSROOM/BREAKROOM

FOR USE ON DOOR #(S):

109 108B

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	MA561H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	SURFACE CLOSER	SC81A HDPA	689	FAL
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 71 - BREAKRM

FOR USE ON DOOR #(S):

110

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	CLASSROOM LOCK	MA561H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 80 - STORAGE/WH CLOSET

FOR USE ON DOOR #(S):

116 117

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	MA581H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	OH STOP	450S	630	GLY
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 81 - STORAGE

FOR USE ON DOOR #(S):

122

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	MA581H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	SURFACE CLOSER	SC81A REG	689	FAL
1	EA	WALL STOP	WS406/407CVX	630	IVE

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	GASKETING	8303AA (SIZE AS REQ'D)	AA	ZER
1	EA	RAIN DRIP SWEEP	8197AA (SIZE AS REQ'D)	AA	ZER
1	EA	THRESHOLD	65A (SIZE AS REQ'D)	A	ZER

HARDWARE GROUP NO. 82 - STORAGE

FOR USE ON DOOR #(S):

102 111

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	MA581H SN	626	FAL
1	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. AL-01 - BREAK AREA ENTRY

FOR USE ON DOOR #(S):

102

PROVIDE EACH SGL DOOR(S) WITH THE FOLLOWING:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112XY	628	IVE
1	EA	NARROW DEADLOCK	1602	626	ACC
2	EA	SFIC MORTISE HOUSING	C987	630	FAL
2	EA	SFIC CORE	COORDINATE WITH OWNER		BES
1	EA	PUSH/PULL BAR	9190EZHD-10"-NS	630-316	IVE
1	EA	SURFACE CLOSER	SC81A SS	689	FAL
1	EA	CUSH SHOE SUPPORT	SC80A-30 (AS REQ'D)	689	FAL
1	EA	BLADE STOP SPACER	SC80A-61 (AS REQ'D)	689	FAL
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)	AA	ZER
1	EA	GASKETING	PROVIDED BY DOOR SUPPLIER		B/O
1	EA	DOOR SWEEP	PROVIDED BY DOOR SUPPLIER		B/O
1	EA	THRESHOLD	PROVIDED BY DOOR SUPPLIER		

COORDINATE HARDWARE WITH ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER. BALANCE OF HARDWARE BY ALUMINUM DOOR/FRAME MANUFACTURER/SUPPLIER.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Insulating glass units.

B. Glazing units.

C. Plastic sheet glazing units.

D. Plastic films.

E. Glazing compounds and accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 20 00 - Finish Carpentry: Finish components with requirement for plastic.

B. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

C. Section 08 14 16 - Flush Wood Doors: Glazed lites in doors.

D. Section 08 43 13 - Aluminum-Framed Storefronts: Glazing furnished as part of storefront assembly.

E. Section 08 51 23 - Steel Windows: Glazing furnished by window manufacturer.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).

D. ASTM C1036 - Standard Specification for Flat Glass; 2025.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2025.

F. ASTM C1376 - Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass; 2015.

G. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

H. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

I. GANA (GM) - GANA Glazing Manual; 2022.

J. GANA (SM) - GANA Sealant Manual; 2008.

K. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

L. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

M. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

N. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

1.4 PREINSTALLATION CONFERENCE

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by each of the affected installers.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data on Insulating Glass Unit, Glazing Unit, Plastic Sheet Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.

D. Samples: Submit two samples 12 by 12 inch in size of glass units.

E. Manufacturer's Qualification Statement.

F. Installer's Qualification Statement.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Government's name and registered with manufacturer.

H. Maintenance Materials: Furnish the following for Government's use in maintenance of project.

1. See Section 01 78 23-Operation and Maintenance Data , for additional provisions.
2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.6 QUALITY ASSURANCE

A. Perform Work in accordance with GANA (GM), GANA (SM), and IGMA TM-3000 for glazing installation methods. Maintain one copy on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

C. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

D. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.7 MOCK-UPS

A. See Section 01 40 00 - Quality Requirements, for additional mock-up requirements.

B. Provide mock-up of wall including glass and air barrier and vapor retarder seal.

C. Mock-ups may remain as part of the Work.

1.8 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 40 degrees F.

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data , for additional warranty requirements.

B. Insulating Glass Units: Provide a five (5) year manufacturer warranty to include coverage for seal failure, interpane dusting or misting, including providing products to replace failed units.

C. Laminated Glass: Provide a five (5) year manufacturer warranty to include coverage for delamination, including providing products to replace failed units.

D. Polycarbonate Sheet Glazing: Provide a five (5) year manufacturer warranty to include coverage for breakage, coating failure, abrasion resistance, including providing products to replace failed units.

E. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Glass Fabricators:

1. Basis of Design: Vitro Architectural Glass (formerly PPG).
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Float Glass Manufacturers:

1. Basis of Design: Vitro Architectural Glass (formerly PPG Glass)
: www.vitroglazings.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

C. Laminated Glass Manufacturers:

1. Basis of Design: Vitro Architectural Glass.
2. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

D. Plastic Films Manufacturers:

1. Basis of Design: 3M Window Film
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING ASSEMBLIES

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads, and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass. See below for salient characteristics.

1. Design Pressure: Calculated in accordance with applicable codes.
2. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
3. Provide glass edge support system sufficiently stiff to limit the lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
4. Glass thicknesses listed are minimum.

B. Vapor Retarder and Air Barrier Seals (Salient Characteristics): Provide completed assemblies that maintain continuity of building enclosure vapor retarder and air barrier.

1. In conjunction with vapor retarder and joint sealer materials described in other sections.

C. Thermal and Optical Performance (Salient Characteristics): Provide exterior glazing products with performance properties as indicated. Performance properties are in accordance with manufacturer's published data as determined with the following procedures and/or test methods:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW 6.3 computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

2.3 GLASS MATERIALS

A. Float Glass (Salient Characteristics): Provide float glass based glazing unless otherwise indicated.

1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality - Q3.
2. Kind HS - Heat-Strengthened Type: Complies with ASTM C1048.
3. Kind FT - Fully Tempered Type: Complies with ASTM C1048.
4. Fully Tempered Safety Glass: Complies with ANSI Z97.1 or 16 CFR 1201 criteria for safety glazing used in hazardous locations.
5. Heat-Soak Testing (HST): Provide HST of fully tempered glass used on other demanding applications of project, to reduce risks of spontaneous breakage due to nickel sulfide (NiS) induced fractures in accordance with industry established testing requirements.

2.4 INSULATING GLASS UNITS

A. Manufacturers:

1. Basis of Design: Vitro Architectural Glass (formerly PPG Glass); www.vitroglazings.com/#sle.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Insulating Glass Units: Types as indicated.

1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
2. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
3. Metal Edge Spacers: Aluminum, bent and soldered corners.
4. Spacer Color: Black.
5. Edge Seal:
   a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.
   b. Color: Black.
6. Purge interpane space with dry air, hermetically sealed.

C. Insulating Glass Units: Vision glass, double glazed.

1. Applications: Exterior glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Outboard Lite: Annealed float glass, except fully tempered float glass at locations noted on Drawings and required by Code, 1/4 inch thick, minimum.
   a. Tint: Clear.
4. Inboard Lite: Annealed float glass, except fully tempered float glass at locations noted on Drawings and required by Code, 1/4 inch thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch.
6. See basis of design information for technical requirements.
7. Glazing Method: Dry glazing method, gasket glazing.

2.5 BASIS OF DESIGN - INSULATING GLASS UNITS

A. Basis of Design - Insulating Glass Units: Vision glazing, with Low-E coating.

1. Applications: Exterior insulating glass glazing unless otherwise indicated.
2. Space between lites filled with air.
3. Total Thickness: 1 inch.
4. Thermal Transmittance (U-Value), Winter - Center of Glass: 0.28, nominal.
5. Visible Light Transmittance (VLT): 64 percent, nominal.
6. Solar Heat Gain Coefficient (SHGC): 0.27, nominal.
7. Visible Light Reflectance, Outside: 12 percent, nominal.
8. Glazing Method: Dry glazing method, gasket glazing.
9. Coated Glass: Comply with requirements of ASTM C1376 for pyrolytic (hard-coat) or magnetic sputter vapor deposition (soft-coat) type coatings on flat glass; coated vision glass, Kind CV; coated overhead glass, Kind CO; or coated spandrel glass, Kind CS.
10. Metal Edge Spacers: Aluminum, bent and soldered corners.
11. Spacer Color: Black.
12. Edge Seal:
    a. Dual-Sealed System: Provide polyisobutylene sealant as primary seal applied between spacer and glass panes, and silicone, polysulfide, or polyurethane sealant as secondary seal applied around perimeter.

13. Color: Black.
14. Purge interpane space with dry air, hermetically sealed.
15. Basis of Design - Vitro Architectural Glass (formerly PPG Glass): www.vitroglazings.com.
16. Outboard Lite: Annealed float glass, except fully tempered float glass at locations noted on drawings or required by Code, 1/4 inch thick, minimum.
    a. Low-E Coating: Vitro Architectural Glass (formerly PPG Glass) Solarban 70XL on #2 surface.
    b. Glass: Clear.
17. Inboard Lite: Annealed float glass, except fully tempered float glass at locations noted on drawings or required by Code float glass, 1/4 inch thick.
18. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of another acceptable manufacturer.
19. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.6 GLAZING UNITS

A. Monolithic Interior Vision Glazing:

1. Applications: Interior glazing unless otherwise indicated.
2. Glass Type: Annealed float glass.
3. Tint: Clear.
4. Thickness: 1/4 inch, nominal.

2.7 ACCESSORIES

A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II . Length of 0.1 inch for each square foot of glazing or minimum 4 inch by width of glazing rabbet space minus 1/16 inch by height to suit glazing method and pane weight and area.

B. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.

PART 3 EXECUTION

3.1 VERIFICATION OF CONDITIONS

A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.

B. Verify that the minimum required face and edge clearances are being provided.

C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.

D. Proceed with glazing system installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean contact surfaces with appropriate solvent and wipe dry within maximum of 24 hours before glazing. Remove coatings that are not tightly bonded to substrates.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant where required for proper sealant adhesion.

3.3 INSTALLATION, GENERAL

A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.

B. Do not exceed edge pressures around perimeter of glass lites as stipulated by glass manufacturer.

C. Set glass lites of system with uniform pattern, draw, bow, and similar characteristics.

D. Set glass lites in proper orientation so that coatings face exterior or interior as indicated.

E. Prevent glass from contact with any contaminating substances that may be the result of construction operations such as, and not limited to the following; weld splatter, fire-safing, plastering, mortar droppings, etc.

3.4 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

A. Application - Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.

B. Place setting blocks at 1/4 points with edge block no more than 6 inch from corners.

C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.5 CLEANING

A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.

B. Remove non-permanent labels immediately after glazing installation is complete.

C. Clean glass and adjacent surfaces after sealants are fully cured.

D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.6 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION 08 80 00

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SECTION 08 88 01 - SPECIAL FUNCTION GLAZING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Laminated security glazing units.

B. Insulating security glazing units.

1.2 RELATED REQUIREMENTS

A. Section 07 92 00 - Joint Sealants: Sealants for other than glazing purposes.

B. Section 08 43 13 - Aluminum-Framed Storefronts: Security glazing provided as part of storefront assembly.

C. Section 08 87 23 - Safety and Security Films.

1.3 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; Current Edition.

B. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

C. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

D. ASTM F2248 - Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass; 2012.

E. GSA TS01 - Standard Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings; General Services Administration; 2003.

F. IGMA TM-3000 - North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use; 1990 (Reaffirmed 2016).

G. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2017.

H. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014, with Errata (2017).

I. NFRC 300 - Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems; 2017.

J. NGA (LGRM) - Laminated Glazing Reference Manual; 2019.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene preinstallation meeting one week before starting work of this section; require attendance by each affected installer.

1.5 SUBMITTALS

A. See Section 013323 - Submittal Procedures for submittal procedures.

B. Product Data on Insulating Glass Unit, Polycarbonate Glazing Unit, and Plastic Film Glazing Types: Provide structural, physical, and environmental characteristics, size limitations, special handling, and installation requirements.

1.6 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Float Glass Manufacturers:

1. Basis of Design: Vitro Architectural Glass (formerly PPG Glass), www.vitroglazings.com/#sle.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 PERFORMANCE REQUIREMENTS - EXTERIOR GLAZING

A. Provide type and thickness of exterior glazing assemblies to support assembly dead loads and to withstand live loads caused by positive and negative wind pressure acting normal to plane of glass.

1. Comply with ASTM E1300 for design load resistance of glass type, thickness, dimensions, and maximum lateral deflection of supported glass.
2. Provide glass edge support system sufficiently stiff to limit lateral deflection of supported glass edges to less than 1/175 of their lengths under specified design load.
3. Glass thicknesses listed are minimum.

B. Weather-Resistive Barrier Seals (Salient Characteristics): Provide completed assemblies that maintain continuity of building enclosure.

1. Coordinate with weather-barrier-related materials described in other sections, as follows:

C. Thermal and Optical Performance (Salient Characteristics): Provide exterior glazing products with performance properties in accordance with manufacturer's published data as determined by the following procedures:

1. Center of Glass U-Value: Comply with NFRC 100 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.
2. Center of Glass Solar Heat Gain Coefficient (SHGC): Comply with NFRC 200 using Lawrence Berkeley National Laboratory (LBNL) WINDOW computer program.
3. Solar Optical Properties: Comply with NFRC 300 test method.

END OF SECTION 08 88 01

SECTION 09 05 61 - COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:

1. Thin-set ceramic tile and stone tile.

B. Removal of existing floor coverings.

C. Remedial floor coatings.

D. Preparation of new and existing wood-based floors and subfloors for installation of new floor coverings.

1.2 REFERENCE STANDARDS

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.4 SUBMITTALS

A. Visual Observation Report: For existing floor coverings to be removed.

B. Remedial Materials Product Data: Manufacturer's published data on each product to be used for remediation.

1. Manufacturer's statement of compatibility with types of flooring applied over remedial product.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, handle, and protect products in accordance with manufacturer’s instructions and recommendations.

B. Deliver materials in manufacturer’s packaging; include installation instructions.

C. Keep materials from freezing.

PART 2 PRODUCTS

2.1 MATERIALS

PART 3 EXECUTION

3.1 REMOVAL OF EXISTING FLOOR COVERINGS

A. Comply with local, State, and federal regulations and recommendations of RFCI Recommended Work Practices for Removal of Resilient Floor Coverings, as applicable to floor covering being removed.

B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.2 PRELIMINARY CLEANING

A. Clean floors of dust, solvents, paint, wax, oil, grease, asphalt, residual adhesive, adhesive removers, film-forming curing compounds, sealing compounds, alkaline salts, excessive laitance, mold, mildew, and other materials that might prevent adhesive bond.

B. Do not use solvents or other chemicals for cleaning.

3.3 PREPARATION

A. See individual floor covering section(s) for additional requirements.

B. Comply with requirements and recommendations of floor covering manufacturer.

C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.

D. Do not fill expansion joints, isolation joints, or other moving joints.

3.4 PROTECTION

A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 09 05 61

SECTION 09 21 16 - GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal stud wall framing.

C. Metal channel ceiling framing.

D. Acoustic insulation.

E. Gypsum sheathing.

F. Cementitious backing board.

G. Gypsum wallboard.

H. Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Wood blocking product and execution requirements.

1.3 REFERENCE STANDARDS

A. ANSI A108.11 - American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

C. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2017.

D. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2018.

E. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.

F. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2019b.

G. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2018.

H. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2018.

I. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2019.

J. ASTM C1278/C1278M - Standard Specification for Fiber-Reinforced Gypsum Panel; 2017.

K. ASTM C1325 - Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2019.

L. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2017.

M. ASTM C1658/C1658M - Standard Specification for Glass Mat Gypsum Panels; 2019.

N. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2016.

O. GA-216 - Application and Finishing of Gypsum Panel Products; 2016.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum five years of experience.

PART 2 PRODUCTS

2.1 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

1. See PART 3 for finishing requirements.

2.2 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:

1. Basis of Design: ClarkDietrich: www.clarkdietrich.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Non-structural Framing System Components (Salient Characteristics): ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf.

1. Studs: C-shaped with knurled or embossed faces.
2. Runners: U shaped, sized to match studs.
3. Ceiling Channels: C-shaped.
4. Furring Members: Hat-shaped sections, minimum depth of 7/8 inch.

2.3 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:

1. Basis of Design: Georgia-Pacific Gypsum: www.gpgypsum.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Gypsum Wallboard (Salient Characteristics): Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.

1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.

2. Glass mat faced gypsum panels, as defined in ASTM C1658/C1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
3. Unfaced fiber-reinforced gypsum panels as defined in ASTM C1278/C1278M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
4. Lightweight gypsum panels meeting ASTM C1396/C1396M with a weight of 1.8lb./sq.ft., may be substituted for standard weight paper-faced board.
5. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
   a. Mold resistant board is required at all locations.
6. Thickness:
   a. Vertical Surfaces: 5/8 inch.
   b. Ceilings: 1/2 inch.

C. Backing Board For Wet Areas (Salient Characteristics): One of the following products:

1. Application: Surfaces behind tile in wet areas including tub and shower surrounds, shower ceilings, and wet walls in restrooms.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
   a. Thickness: 1/2 inch.
   b. Manufacturers:
      1) Basis of Design: USG Corporation: www.usg.com.
      2) Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

D. Backing Board For Non-Wet Areas (Salient Characteristics): Water-resistant gypsum backing board as defined in ASTM C1396/C1396M; sizes to minimum joints in place; ends square cut.

1. Application: Vertical surfaces behind thinset tile, except in wet areas.
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. Type: Regular and Type X, in locations indicated.
4. Type X Thickness: 5/8 inch.
5. Regular Board Thickness: 5/8 inch.
6. Edges: Tapered.

2.4 GYPSUM WALLBOARD ACCESSORIES

A. Finishing Accessories: ASTM C1047, galvanized steel or rolled zinc, unless noted otherwise.

1. Types: As detailed or required for finished appearance.
2. Products:
   a. Basis of Design: ClarkDietrich: www.clarkdietrich.com.
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.

1. Fiberglass Tape: 2 inch wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Joint Compound: Setting type, field-mixed.

C. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inches in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion-resistant.

D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

E. Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.

1. Level ceiling system to a tolerance of 1/600.
2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center.

1. Extend partition framing to structure where indicated and to ceiling in other locations.
2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Blocking: Install wood blocking for support of:

1. Wall-mounted cabinets.
2. Toilet partitions.
3. Toilet accessories.

3.3 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Nonrated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

D. Installation on Metal Framing: Use screws for attachment of gypsum board.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet apart on walls and ceilings over 50 feet long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.5 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Walls and ceilings to receive semi-gloss or gloss paint finish and other areas specifically indicated.
   2. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
   3. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   4. Level 1: Fire-resistance-rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch.

C. Where Level 5 finish is indicated, spray apply high build drywall surfacer over entire surface after joints have been properly treated; achieve a flat and tool mark-free finish.

D. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.6 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION 09 21 16

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SECTION 09 30 00 - TILING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Tile for wall applications.

1.2 REFERENCE STANDARDS

A. ANSI A108/A118/A136 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.

B. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017.

C. ANSI A108.1b - Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

D. ANSI A108.1c - Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set, Modified Dry-Set, or Improved Modified Dry-Set Cement Mortar; 2023.

E. ANSI A108.2 - American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.

F. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

G. ANSI A108.5 - Setting of Ceramic Tile with Dry-Set Cement Mortar, Modified Dry-Set Cement Mortar, EGP (Exterior Glue Plywood) Modified Dry-Set Cement Mortar, or Improved Modified Dry-Set Cement Mortar; 2023.

H. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 2023.

I. ANSI A108.8 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2024).

J. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 2023.

K. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).

L. ANSI A108.12 - Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Modified Dry-Set Mortar; 2023.

M. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2016).

N. ANSI A108.19 - American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2017.

O. ANSI A118.3 - American National Standard Specifications for Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy and Water Cleanable Tile-Setting Epoxy Adhesive; 2013 (Revised).

P. ANSI A137.1 - American National Standard Specifications for Ceramic Tile; 2022.

Q. ASTM C373 - Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018.

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2019.

1.3 PREINSTALLATION CONFERENCE:

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by affected installers.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, ceramic accessories, and setting details.

D. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

E. Maintenance Materials: Furnish the following for Government's use in maintenance of project.

1. See Section 01 78 23-Operation and Maintenance Data, for additional provisions.
2. Extra Tile: 10 square feet of each size, color, and surface finish combination.

1.5 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications:

1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.7 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature above 50 degrees F and below 100 degrees F during installation and curing of setting materials.

PART 2 PRODUCTS

2.1 TILE

A. Manufacturers:

1. Basis of Design: Architessa.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Porcelain Tile (Salient Characteristics): ANSI A137.1 standard grade.

1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
2. Size(s): As indicated on drawings.
3. Thickness: 5/16 inch.
4. Edges: Rectified.
5. Surface Finish: Honed.
6. Color(s): As indicated on drawings.
7. Pattern: As indicated on drawings..

2.2 SETTING MATERIALS

A. Manufacturers:

1. Basis of Design: Mapei.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Epoxy Adhesive and Mortar Bond Coat (Salient Characteristics): ANSI A118.3.

1. Applications: Use this type of bond coat where indicated and where no other type of bond coat is indicated.

2.3 GROUTS

A. Manufacturers:

1. Basis of Design: Mapei.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

B. Epoxy Grout (Salient Characteristics): ANSI A118.3 chemical resistant and water-cleanable epoxy grout.

1. Applications: Where indicated and where no other type of grout is indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

B. Verify that required floor-mounted utilities are in correct location.

3.2 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

D. Prepare substrate surfaces for adhesive installation in accordance with adhesive manufacturer's instructions.

3.3 INSTALLATION - GENERAL

A. Install tile, thresholds, and stair treads and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19 , manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep control and expansion joints free of mortar, grout, and adhesive.

H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

I. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.4 INSTALLATION - WALL TILE

A. On exterior walls install in accordance with TCNA (HB) Method W244, thin-set over cementitious backer units, with waterproofing membrane.

B. Over gypsum wallboard on wood or metal studs install in accordance with TCNA (HB) Method W243, thin-set with dry-set or latex-Portland cement bond coat, unless otherwise indicated.

3.5 CLEANING

A. Clean tile and grout surfaces.

3.6 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 30 00

SECTION 09 51 00 - ACOUSTICAL CEILINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Suspended metal grid ceiling system.

B. Acoustical units.

1.2 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2017.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2019.

C. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

D. CHPS (HPPD) - High Performance Products Database; Current Edition at www.chps.net/.

E. UL (GGG) - GREENGUARD Gold Certified Products; Current Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.

B. Do not install acoustical units until after interior wet work is dry.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Maintenance Materials: Furnish the following for Government's use in maintenance of project.

1. See Section 01 78 23-Operation and Maintenance Data, for additional provisions.

1.5 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acoustic Tiles/Panels:

1. Basis of Design: Armstrong World Industries, Inc: www.armstrongceilings.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Suspension Systems:

1. Same as for acoustical units.

2.2 ACOUSTICAL UNITS

A. Acoustical Units - General: ASTM E1264, Class A. See below for salient characteristics.

1. VOC Content: Certified as Low Emission by one of the following:
   a. Product listing in UL (GGG).
   b. Product listing in CHPS (HPPD).

2.3 SUSPENSION SYSTEM(S)

A. Metal Suspension Systems - General (Salient Characteristics): Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, hold down clips, stabilizer bars, clips, and splices as required.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C636/C636M and manufacturer's instructions and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Locate system on room axis according to reflected plan.

D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

G. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.

H. Do not eccentrically load system or induce rotation of runners.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

E. Cutting Acoustical Units:

1. Cut to fit irregular grid and perimeter edge trim.
2. Make field cut edges of same profile as factory edges.

3.4 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 51 00

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SECTION 09 67 00 - FLUID-APPLIED FLOORING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fluid-applied flooring and base.

1.2 RELATED REQUIREMENTS

A. Section 06 16 00 – Wood Sheathing: Tongue and Groove Plywood at plywood subfloor (where indicated in drawings).

B. Section 07 92 00 - Joint Sealants: Sealing joints between fluid-applied flooring and adjacent construction and fixtures.

C. Section 22 10 06 - Plumbing Piping Specialties: Recessed plumbing access cover frames.

1.3 REFERENCE STANDARDS

A. ASTM D570 - Standard Test Method for Water Absorption of Plastics; 2022.

B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics; 2014.

C. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics; 2023.

D. ASTM D905 - Standard Test Method for Strength Properties of Adhesive Bonds in Shear by Compression Loading; 2008 (Reapproved 2013).

E. ASTM D4060 - Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser; 2014.

F. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

G. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2019a, with Editorial Revision (2020).

1.4 SUBMITTALS

A. See Section 01 33 23 – Submittal Procedures, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns and colors available.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Supervisor Qualifications: Trained by product manufacturer , under direct full time supervision of manufacturer's own foreman.

1.6 MOCK-UP

A. Construct mock-up(s) of fluid applied flooring to serve as basis for evaluation of texture and workmanship.

1. Number of Mock-Ups to be Prepared: One at Education Center (Area 1); One at Admin Building (Area 2).

2. Use same materials and methods for use in the work.
3. Locate where directed.
4. Minimum Size: 48 inches by 48 inches.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store resin materials in a dry, secure area.

B. Store materials for three days prior to installation in area of installation (climate controlled) to achieve temperature stability.

1.8 FIELD CONDITIONS

A. Maintain minimum temperature in storage area of 55 degrees F.

B. Store materials in area of installation for minimum period of 72 hours prior to installation.

C. Maintain space ambient temperature required by manufacturer 72 hours prior to, during, and 24 hours after installation of materials.

1.9 WARRANTY

A. See Section 01 77 00 – Closeout Procedures, for additional warranty requirements.

B. Manufacturer Warranty: Provide 2-year manufacturer warranty against premature material failure. Complete forms in Government's name and register with manufacturer.

C. Applicator Warranty: Provide 2-year warranty for all fluid-applied flooring installations commencing on date of Substantial Completion. Complete forms in Government's name and register with manufacturer.

D. Finish Warranty: Provide 3-year manufacturer warranty against excessive degradation of exposed finish. Include provision for replacing areas with excessive fading, chalking, or flaking. Complete forms in Government's name and register with manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Fluid-Applied Flooring:

1. Basis of Design Manufacturer: Res-Tek.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

2.2 FLUID-APPLIED FLOORING SYSTEMS

A. Flooring System:

1. Basis of Design System: EPO-Guard.
2. Description: Flexible Broadcast Solid Color Overlay flooring System with the following salient characteristics:
   a. Surface: Non-porous, seamless, chemical resistant, UV resistant.
   b. Material / Thickness: Multi-layer Epoxy; 110-130 mil.
   c. Compressive Strength (ASTM C-579): 8,000 psi
   d. Tensile Strength (ASTM C307): 6,600 psi
   e. Tensile Elongation at Break (ASTM C307): 169%
   f. Hardness (ASTM D-2240, Shore D): 81
   g. Abrasion Resistance (ASTM D-4060, CS-17): 135 mg
   h. Adhesion: Manufacturer Warrants Bonding to Plywood Substrate.
   i. VOC Content (ASTM D-2369, Method E): Each layer = 0 g/l
   j. Coefficient of Friction (ASTM D 2047): meets or exceeds ABA recommendations (federal accessibility standards) when a slip-resistant broadcast is added.
   k. Cure Time: Full Service 7 days from installation of final coat.

3. System Components (multiple-layers):
   a. Substrate Joint Treatment: Joint Treatment with fluid primer and fiberglass mesh over tongue and groove plywood. Joint treatment primer and mesh provided by flooring manufacturer.
      1) Basis of Design: Res-Tek EPO-260
   b. Primer: Full coverage primer layer (intended for plywood substrates).
      1) Basis of Design: Res-Tek EPO-260
   c. Body Coat: Pigmented Epoxy layer with broadcast flakes.
      1) Basis of Design: Res-Tek EPO-260 with Broadcast Flake
   d. Grout Coat: Pigmented Epoxy layer (as recommended by manufacturer)
      1) Basis of Design: Res-Tek EPO-204
   e. Top Coat: High-Traffic Pigmented Urethane (as recommended by manufacturer)
      1) Basis of Design: Res-Tek ISO-103
      2) Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.3 INTEGRAL COVE BASE

A. Cove:

1. Source: Provide integral, seamless, epoxy cove base of same material and by same manufacturer as flooring system.
2. Height: As indicated in drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that subfloor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive flooring.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive flooring.

C. Verify that subfloor surfaces are dust-free and free of substances that could impair bonding of materials to subfloor surfaces.

D. Verify that wood subfloors have 12 percent maximum moisture content. Provide moisture mitigation measures as recommended by manufacturer, when necessary to achieve moisture content, and to ensure proper material bonding characteristics where flooring system meets substrate.

3.2 PREPARATION

A. Remove subfloor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler.

B. Vacuum clean substrate.

C. Apply primer to surfaces required by flooring manufacturer.

3.3 INSTALLATION - FLOORING

A. Apply in accordance with manufacturer's instructions.

B. Apply each coat to minimum thickness indicated.

C. Finish to smooth level surface.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

3.5 PROTECTION

A. Prohibit traffic on floor finish for 48 hours after installation.

B. Barricade area to protect flooring until fully cured.

END OF SECTION 09 67 00

SECTION 09 91 13 - EXTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish exterior surfaces exposed to view, unless fully factory-finished and as noted on drawings .

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Non-metallic roofing and flashing.
5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, zinc, and lead.
6. Floors, unless specifically indicated.
7. Glass.
8. Concealed pipes, ducts, and conduits.

1.2 DEFINITIONS

A. Comply with ASTM D16 for interpretation of terms used in this section.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

B. Samples: Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 8 1/2 x 11 inch in size.

C. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

D. Maintenance Materials: Furnish the following for Government's use in maintenance of project.

1. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
2. Label each container with color in addition to the manufacturer's label.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. Basis of Design: Sherwin-Williams Company: www.sherwin-williams.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless required to be a field-catalyzed paint. See below for salient characteristics.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.

3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content:

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability: Comply with applicable code for surface burning characteristics.

D. Sheens: Provide the sheens specified; where sheen is not specified, sheen will be selected later by Contracting Officer from the manufacturer's full line.

E. Colors: As indicated on drawings.

1. Extend colors to surface edges; colors may change at any edge as directed by Contracting Officer.

2.3 PAINT SYSTEMS - EXTERIOR

A. Exterior Surfaces to be Painted, Unless Otherwise Indicated: Including primed metal and bare steel.

1. Two top coats and one coat primer.
2. Top Coat(s): Exterior Latex; MPI #10, 11, 15, 119, or 214.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin application of paints and finishes until substrates have been properly prepared.

B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

D. Test shop-applied primer for compatibility with subsequent cover materials.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

C. Apply each coat to uniform appearance.

D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

E. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 13

SECTION 09 91 23 - INTERIOR PAINTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Surface preparation.

B. Field application of paints.

C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.

1. Mechanical and Electrical:
   a. In finished areas, paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, mechanical equipment, and electrical equipment, unless otherwise indicated.

D. Do Not Paint or Finish the Following Items:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Items indicated to receive other finishes.
3. Items indicated to remain unfinished.
4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
5. Stainless steel, anodized aluminum, bronze, terne coated stainless steel, and lead items.
6. Marble, granite, slate, and other natural stones.
7. Floors, unless specifically indicated.
8. Ceramic and other tiles.
9. Brick, architectural concrete, cast stone, integrally colored plaster and stucco.
10. Glass.
11. Concealed pipes, ducts, and conduits.

1.2 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D4442 - Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Based Materials; 2020.

C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.

D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.3 SUBMITTALS

A. Product Data: Provide complete list of products to be used, with the following information for each:

1. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").

2. MPI product number (e.g. MPI #47).
3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
4. Manufacturer's installation instructions.

B. Samples: Submit two painted samples, illustrating selected colors for each color and system selected with specified coats cascaded. Submit on tempered hardboard, 8 1/2 x 11 inch in size.

C. Manufacturer's Instructions: Indicate special surface preparation procedures.

D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

E. Maintenance Materials: Furnish the following for Government's use in maintenance of project.

1. Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.
2. Label each container with color in addition to the manufacturer's label.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum three years experience and approved by manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.

C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.6 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.

C. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.

B. Paints:

1. Basis of Design: Sherwin-Williams Company: www.sherwin-williams.com.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

C. Primer Sealers: Same manufacturer as top coats.

2.2 PAINTS AND FINISHES - GENERAL

A. Paints and Finishes: Ready mixed, unless intended to be a field-catalyzed paint. See below for salient characteristics.

1. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
2. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
3. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
4. Supply each paint material in quantity required to complete entire project's work from a single production run.
5. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

B. Volatile Organic Compound (VOC) Content (Salient Characteristics):

1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
   a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
   b. Ozone Transport Commission (OTC) Model Rule, Architectural, Industrial, and Maintenance Coatings; www.otcair.org; specifically:
      1) Opaque, Flat: 50 g/L, maximum.
      2) Opaque, Nonflat: 150 g/L, maximum.
      3) Opaque, High Gloss: 250 g/L, maximum.
2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.

C. Flammability (Salient Charactert: Comply with applicable code for surface burning characteristics.

D. Sheens (Salient Characteristics): Provide the sheens specified; where sheen is not specified, sheen will be selected later by Contracting Officer from the manufacturer's full line.

E. Colors (Salient Characteristics): To be selected from manufacturer's full range of available colors.

1. Selection to be made by Contracting Officer after award of contract.

2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to Government.
3. Extend colors to surface edges; colors may change at any edge as directed by Contracting Officer.
4. In finished areas, finish pipes, ducts, conduit, and equipment the same color as the wall/ceiling they are mounted on/under.

2.3 PAINT SYSTEMS - INTERIOR

A. See below for salient characteristics.

B. Interior Surfaces to be Painted, Unless Otherwise Indicated: Including gypsum board, concrete masonry units, and wood.

1. Two top coats and one coat primer.
2. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
3. Top Coat Sheen:
   a. Eggshell: MPI gloss level 3; use this sheen at all locations.
4. Primer: As recommended by top coat manufacturer for specific substrate.

C. Medium Duty Door/Trim: For surfaces subject to frequent contact by occupants, including metals:

1. Medium duty applications include door frames.
2. Two top coats and one coat primer.
3. Top Coat(s): High Performance Architectural Interior Latex; MPI #138, 139, 140, or 141.
4. Top Coat Sheen:
   a. Semi-Gloss: MPI gloss level 5; use this sheen at all locations.
5. Primer: As recommended by top coat manufacturer for specific substrate.

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.

B. Patching Material: Latex filler.

C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.

B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.

C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

1. Gypsum Wallboard: 12 percent.
2. Masonry, Concrete, and Concrete Masonry Units: 12 percent.
3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.

3.2 PREPARATION

A. Clean surfaces thoroughly and correct defects prior to application.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.

D. Seal surfaces that might cause bleed through or staining of topcoat.

E. Masonry:

1. Prepare surface as recommended by top coat manufacturer.

F. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.

G. Wood Surfaces to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.

3.3 APPLICATION

A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.

B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".

C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.

E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.

F. Sand wood and metal surfaces lightly between coats to achieve required finish.

G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

H. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

A. Protect finishes until completion of project.

B. Touch-up damaged finishes after Substantial Completion.

END OF SECTION 09 91 23

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SECTION 10 14 00 - SIGNAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Room and door signs.

B. Interior directional and informational signs.

C. Emergency evacuation maps.

D. Building identification signs.

E. Traffic signs.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

D. NFPA 170 - Standard for Fire Safety and Emergency Symbols; 2024.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.

1. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule in addition to the number to be used on the sign.
2. When content of signs is indicated to be determined later, request such information from Government through Contracting Officer at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Government through Contracting Officer prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Flat Signs:

1. Basis of Design: FASTSIGNS: www.fastsigns.com/#sle.

2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

B. Dimensional Letter Signs:

1. Basis of Design: FASTSIGNS: www.fastsigns.com/#sle.
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

2.2 SIGNAGE APPLICATIONS

2.3 SIGN TYPES

A. Flat Signs: Signage media without frame.

1. Edges: Square.
2. Corners: Square.
3. Frame Finish: Natural (clear) anodized.
4. Wall Mounting of One-Sided Signs: Refer to Drawings..

B. Color and Font: Unless otherwise indicated:

1. Character Font: Refer to Drawings.
2. Character Case: Upper and lower case (title case). Refer to Drawings.
3. Background Color: Masked and Painted (P1). Refer to Drawings..
4. Character Color: Contrasting color. Refer to Drawings.

2.4 TACTILE SIGNAGE MEDIA

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color:

1. Total Thickness: 1/16 inch.

2.5 DIMENSIONAL LETTERS

A. Metal Letters:

1. Metal: Aluminum casting.
2. Metal Thickness: As indicated on drawings.
3. Letter Height: As indicated on drawings.
4. Finish: Brushed, satin.
5. Mounting: As indicated on drawings.

2.6 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Locate signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until Date of Substantial Completion; repair or replace damaged items.

END OF SECTION 10 14 00

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SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Commercial toilet accessories.

B. Commercial shower and bath accessories.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed supports for accessories, including in wall framing and plates.

B. Section 09 30 00 - Tiling: Ceramic washroom accessories.

C. Section 22 40 00 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM C1036 - Standard Specification for Flat Glass; 2025.

C. ASTM C1503 - Standard Specification for Silvered Flat Glass Mirror; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Commercial Toilet, Shower, and Bath Accessories:

1. Basis of Design: Bobrick
2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 MATERIALS

A. Accessories - General (Salient c: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets with flat surfaces.

2.3 COMMERCIAL TOILET ACCESSORIES

A. Toilet Paper Dispenser: Double roll, surface mounted, for cored or coreless type rolls.

B. Soap Dispenser: Liquid soap dispenser, wall-mounted, surface, with stainless steel cover and horizontal stainless steel tank and working parts; push type soap valve, check valve, and window gauge refill indicator, tumbler lock.

1. Minimum Capacity: 40 ounces.

C. Mirrors: Stainless steel framed, 1/4 inch thick annealed float glass; ASTM C1036.

1. Annealed Float Glass: Silvering, protective and physical characteristics in compliance with ASTM C1503.
2. Size: As scheduled.
3. Frame: 0.05 inchangle shapes, with mitered and welded and ground corners, and tamperproof hanging system; satin finish.
4. Backing: Full-mirror sized, minimum 0.03 inch galvanized steel sheet and nonabsorptive filler material.

D. Grab Bars: Stainless steel, smooth surface.

1. Standard Duty Grab Bars:
   a. Push/Pull Point Load: 250 pound-force, minimum.
   b. Dimensions: 1-1/2 inch outside diameter, minimum 0.05 inch wall thickness, exposed flange mounting, 1-1/2 inch clearance between wall and inside of grab bar.
   c. Finish: Satin.
   d. Length and Configuration: As indicated on drawings.

E. Sanitary Napkin Disposal Unit: Stainless steel, surface-mounted, full-length stainless steel piano-type hinge.

2.4 COMMERCIAL SHOWER AND BATH ACCESSORIES

A. Shower Curtain Rod: Stainless steel tube, 1 inch outside diameter, 0.04 inch wall thickness, satin-finished, with 3 inch outside diameter, minimum 0.04 inch thick satin-finished stainless steel flanges, for installation with exposed fasteners.

B. Shower Curtain:

1. Material: Opaque vinyl, 0.008 inch thick, matte finish, with antibacterial treatment, flameproof and stain-resistant.
2. Material: Cotton, machine washable, and mildew-resistant.
3. Size: 70 by 72 inches, hemmed edges.
4. Grommets: Stainless steel; pierced through top hem on 6 inch centers.
5. Color: White.
6. Shower Curtain Hooks: Chrome-plated or stainless steel spring wire designed for snap closure.

C. Folding Shower Seat: Wall-mounted surface; welded tubular seat frame, structural support members, swing-down legs, hinges, and mechanical fasteners of Type 304 stainless steel, L-shaped, right hand seat.

1. One-piece, 1/2" thick, compact-grade laminate with matte-finish, ivory-colored, melamine surfaces and black phenolic-resin core - cannot delaminate. Integral slots for water drainage. Secured to frame with stainless steel carriage bolts and acorn nuts.
2. Size: ADA Standards compliant.

D. Double Robe Hook: Heavy-duty stainless steel, double-prong, rectangular-shaped bracket and backplate for concealed attachment, satin finish.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

C. Verify that field measurements are as indicated on drawings.

3.2 PREPARATION

A. Deliver inserts and rough-in frames to site for timely installation.

B. Provide templates and rough-in measurements as required.

3.3 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

3.4 PROTECTION

A. Protect installed accessories from damage due to subsequent construction operations.

END OF SECTION 10 28 00

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SECTION 10 73 16.13 - METAL CANOPIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Freestanding metal canopies.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete footings.

B. Section 07 61 00 - Sheet Metal Roofing: Canopy roof.

1.3 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).

B. AISC 303 - Code of Standard Practice for Steel Buildings and Bridges; 2022, with Errata (2025).

C. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).

F. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.

G. ASTM A572/A572M - Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel; 2021, with Editorial Revision.

H. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

I. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2021.

J. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric); 2021.

K. ASTM B308/B308M - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles; 2020.

L. ASTM B429/B429M - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube; 2010e1.

M. ASTM C1107/C1107M - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink); 2020.

N. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs; 2022.

O. ASTM F3125/F3125M - Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi

Minimum Tensile Strength, and Metric Dimensions 830 MPa and 1040 MPa Minimum Tensile Strength; 2019.

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Submit product data sheets, including material descriptions and finishes, and preparation instructions and recommendations.

C. Shop Drawings: Prior to commencement of fabrication, submit detailed shop drawings, showing profiles, sections of components, finishes, and fastening details.

D. Design Data: Submit comprehensive structural analysis of design for the specified loads. Stamp and sign calculations by professional engineer.

E. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Government's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1. Comply with applicable code for submission of design calculations as required for acquiring permits.

B. Perform steel work in accordance with AISC 303.

1. Maintain 2 copies on site.

C. Manufacturer Qualifications: Company specializing in the manufacture of products similar to those required for this project.

1. Not less than three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site ready for erection.

B. Package using methods that prevent damage during shipping and storage on site.

C. Store materials under cover and elevated above grade.

1.7 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Metal Canopies: Correct defective work within a two year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Metal Canopies:

1. Basis of Design: Pelican Protective Covers.

2. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

2.2 METAL CANOPIES

A. Shop Fabricated Aluminum Canopy

B. Configuration: Layout and dimensions, column layout, canopy clearance, fascia profile, and roof covering design as indicated on drawings.

1. Installation: Cantilevered Freestanding Aluminum Canopy.
2. Column Anchorage: Column baseplates installed with anchor bolts or expansion anchors into concrete footing, slab, or pier.

C. Performance Requirements:

1. Design and fabricate metal canopy system to resist wind, snow, live, and seismic loads without failure, damage, or permanent deflection in accordance with ASCE 7:

2.3 COMPONENTS

A. Structural Steel Framing (Salient Characteristics):

1. Columns: ASTM A500/A500M, Grade B, round or rectangular tubing, sized to suit project design load requirements.
2. Base and Top Plates: ASTM A36/A36M, with pre-drilled bolt holes.
3. Beams: Wide flange, ASTM A572/A572M Grade 50.
4. Other Structural Steel Members: ASTM A36/A36M.

B. Structural Aluminum Framing (Salient Characteristics): Alloy and temper 6063-T5, 6063-T6, or 6061-T6.

1. Extruded Shapes and Tubes: ASTM B221 (ASTM B221M).
2. Rolled or Extruded Structural Shapes: ASTM B308/B308M.
3. Extruded Structural Pipe and Tube: ASTM B429/B429M.
4. Sheet and Plate: Alloy 5052, 5005, or 6061-T651, ASTM B209/B209M.

C. Covering (Salient Characteristics):

1. Aluminum Decking:
   a. Interlocking extruded aluminum decking modules.
      1) Extruded Decking: ASTM B221 (ASTM B221M), Alloy and temper 6005-T5, 6061-T6, or 6063-T6.
   b. Decking Orientation: Perpendicular to length of canopy (as indicated in drawings).
2. Aluminum Standing Seam Panels: Basis of Design: Protective Cover Manufacturer.
   a. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.
3. Overhang: 3 inches.

D. Fascia (Salient Characteristics): Same material as structural framework, 8 inches high.

E. Anchor Bolts (Salient Characteristics): ASTM A307 or ASTM A572/A572M, formed with bent shank, assembled with template for casting into concrete.

1. Minimum exposed thread of 7 inches above footing and 23 inch minimum embedment.
2. Provide nuts and washers as required for column leveling and plumbing.

F. Concrete Footings: Refer to Section 03 30 00 for additional requirements.

2.4 SHOP FABRICATION

A. Provide a complete system ready for erection at project site.

B. Shop fabricate to the greatest extent possible; disassemble if necessary for shipping.

C. Weld steel members in accordance with AWS D1.1/D1.1M.

D. Fabricate connections for bolt, nut, and washer connectors.

2.5 FINISHES

A. Structural Steel Framing:

1. Shop Primer: Rust-inhibitive red oxide.

B. Aluminum Framing and Decking:

1. Class II Natural Anodized Finish: AAMA 611 AA-M12C22A31, clear anodic coating not less than 0.4 mils thick.

C. Fascia: Polyester baked enamel finish; color as selected from manufacturer's standard range.

2.6 ACCESSORIES

A. Structural Bolts: ASTM F3125/F3125M, Grade A325, minimum 3/4 inch diameter.

B. Trim, Closure Pieces, and Flashings: Same material, thickness and finish as sheet metal decking; factory-fabricated to required profiles.

C. Grout: ASTM C1107/C1107M; non-shrinking; premixed compound consisting of non-metallic aggregate, cement, water-reducing and plasticizing agents.

D. Fasteners, Non-Structural: ASTM F593 stainless steel or ASTM A307 carbon steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and site area for conditions that might prevent satisfactory installation.

B. Verify that foundation, electrical utilities, and placed anchors are in correct position.

C. Do not proceed with installation until all conditions are satisfactory.

3.2 INSTALLATION - FRAMING

A. Provide for erection and wind loads. Provide temporary bracing to maintain structure plumb and in alignment until completion of erection and installation.

B. Set column base plates with non-shrink grout to achieve full plate bearing.

C. Fasten columns to anchor bolts.

D. Do not field cut or alter structural members without approval.

E. After erection, prime welds, abrasions, and surfaces not shop primed.

3.3 INSTALLATION - CANOPY COVERING

A. Install in accordance with manufacturer's instructions.

B. Fasten metal decking to metal support members, aligned level and plumb.

C. Install fascia panels, trim, and flashing.

D. Separate dissimilar metals using concealed bituminous paint.

E. Touch-up damaged finish coating using material provided by manufacturer to match original coating.

3.4 PROTECTION

A. Protect canopy after installation to prevent damage due to other work until Date of Substantial Completion.

END OF SECTION 10 73 16.13

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SECTION 12 24 00 - WINDOW SHADES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior manual roller shades.

1.2 RELATED REQUIREMENTS

A. Section 06 10 00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.

1.3 REFERENCE STANDARDS

A. ASTM E2180 - Standard Test Method for Determining the Activity of Incorporated Antimicrobial Agent(s) in Polymeric or Hydrophobic Materials; 2018.

B. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

C. NFPA 701 - Standard Methods of Fire Tests for Flame Propagation of Textiles and Films; 2023, with Errata.

D. WCMA A100.1 - Safety of Window Covering Products; 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Do not fabricate shades until field dimensions for each opening have been taken with field conditions in place.
2. Do not install shades until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets, including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.

B. Shop Drawings: Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.

C. Source Quality Control Submittals: Provide test reports indicating compliance with specified fabric properties.

D. Selection Samples: Include fabric samples in full range of available colors and patterns.

E. Verification Samples: Minimum size 6 inches square, representing actual materials, color and pattern.

F. Manufacturer's Instructions: Include instructions for storage, handling, protection, examination, preparation, and installation of product.

G. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

H. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Government's name and registered with manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than five years of documented experience.

B. Installer Qualifications: Company specializing in performing work of this type with minimum 3 years of documented experience with shading systems of similar size and type.

1. Manufacturer's authorized representative.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.

B. Handle and store shades in accordance with manufacturer's recommendations.

1.8 FIELD CONDITIONS

1.9 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data, for additional warranty requirements.

B. Provide manufacturer's warranty from Date of Substantial Completion, covering the following:

1. Shade Hardware: One year.
2. Fabric: One year.
3. Aluminum and Steel Coatings: One year.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Interior Manually Operated Roller Shades

B. Source Limitations: Furnish products produced by a single manufacturer and obtained from a single supplier.

2.2 ROLLER SHADES

A. General:

1. Provide shade system components that are easy to remove or adjust without removal of mounted shade brackets.
2. Provide shade system that operates smoothly when shades are raised or lowered.

B. Roller Shades:

1. Description - Interior Roller Shades: Single roller, manually operated fabric window shade system complete with mounting brackets, roller tubes, hembars, hardware, and accessories.
   a. Drop Position: Regular roll.
   b. Mounting: Match Existing..

c. Size: As indicated on drawings.
d. Fabric: As indicated under Shade Fabric article.

2. Brackets and Mounting Hardware: As recommended by manufacturer for mounting indicated and to accommodate shade fabric roll-up size and weight.
   a. Material: Stamped steel.
   b. Multiple Shade Operation: Provide hardware as necessary to operate more than one shade using a single clutch operator.
3. Roller Tubes: As required for type of shade operation.
   a. Material: Extruded aluminum, clear anodized finish.
   b. Size: As recommended by manufacturer; selected for suitability for installation conditions, span, and weight of shades.
   c. Fabric Attachment: Utilize extruded channel in tube to accept vinyl spline welded to fabric edge.
4. Hembars: Designed to maintain bottom of shade straight and flat.
   a. Style: Exposed aluminum bottom bar, flat profile with closed ends; clear anodized finish.
5. Manual Operation for Interior Shades:
   a. Clutch Operator: Manufacturer's standard material and design, permanently lubricated.
   b. Drive Chain: Continuous loop, beaded ball chain with restraining device, 95 lb minimum breaking strength; comply with WCMA A100.1. Provide upper and lower limit stops.
   c. Shade Lift Assistance: Manufacturer's standard spring device contained in the idler end of roller tube to reduce force required to lift shades; as required based on shade weight.
   d. Chain Retainer:
      1) Chain tensioning device complying with WCMA A100.1.
      2) Manufacturer's standard clip.

2.3 SHADE FABRIC

A. Fabric for Room-Darkening Shades: Nonflammable, color-fast, impervious to heat and moisture, and able to retain its shape under normal operation.

1. Material: Vinyl coated polyester.
2. Material Certificates and Product Disclosures:
   a. Environmental Product Declaration (EPD): Complete, published declaration and life cycle analysis.
3. Performance Requirements:
   a. Flammability: Pass NFPA 701 large and small tests.
   b. Fungal Resistance: No growth when tested in accordance with ASTM G21.
   c. Antimicrobial Resistance: Greater than 95 percent reduction of bacteria when tested in accordance with ASTM E2180.
4. Roll Width: 72 inches.
5. Color: As selected by Contracting Officer from manufacturer’s full range of colors.
6. Fabrication:

a. Fabric Orientation: Railroaded, fabric is turned 90 degrees off the roll.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine finished openings for deficiencies that may preclude satisfactory installation.

B. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before proceeding.

C. Start of installation shall be considered acceptance of substrates.

3.2 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.

B. Coordinate with window installation and placement of concealed blocking to support shades.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, using mounting devices as indicated.

B. Replace shades that exceed specified dimensional tolerances at no extra cost to Government.

C. Adjust level, projection, and shade centering from mounting bracket. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.

3.4 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.

B. Replace shades that cannot be cleaned to "like new" condition.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation and maintenance of window shade system to Government's personnel.

B. Training: Train Government's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

3.6 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair, or replace damaged products before Substantial Completion.

3.7 MAINTENANCE

END OF SECTION 12 24 00

SECTION 12 32 00 - MANUFACTURED WOOD CASEWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Manufactured standard and custom casework, with cabinet hardware.

B. Special purpose units.

C. Countertops.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions: VOC limitations for adhesives and sealants.

B. Section 06 10 00 - Rough Carpentry: Blocking and nailers for anchoring casework.

C. Section 07 92 00 - Joint Sealants: Sealing joints between casework and countertops and adjacent walls, floors, and ceilings.

D. Section 09 21 16 - Gypsum Board Assemblies: Reinforcements in metal-framed partitions for anchoring casework.

E. Section 12 36 00 - Countertops: Additional requirements for countertops.

F. Section 22 40 00 - Plumbing Fixtures: Sinks and fittings installed in casework.

G. Section 26 27 26 - Wiring Devices: Switches, receptacles installed in casework.

1.3 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.4 REFERENCE STANDARDS

A. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014, with Errata (2018).

B. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards; 2021, with Errata.

C. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

D. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

E. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Conference: Conduct a preinstallation conference one week prior to the start of the work of this section; require attendance by all affected installers.

B. Keying Conference: Conduct conference prior to ordering keys. Incorporate conference decisions into keying submittal.

1.6 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements, placement dimensions and tolerances, clearances required, and keying information.

D. Samples for Finish Selection: Fully finished, for color selection. Minimum sample size: 2 inches by 3 inches.

1. Wood samples for color and species selection.

E. Casework Samples: Representative of types in the project.

1. Base Cabinet: Cabinet with drawer and door and specified hardware. Type indicated on drawings.

F. Manufacturer's Qualification Statement.

G. Installer's Qualification Statement.

H. Maintenance Data: Manufacturer's recommendations for care and cleaning.

I. Maintenance Materials: Furnish the following for Government's use in maintenance of project:

1. See 01 78 23-Operation and Maintenance Data for additional provisions.

J. Finish touch-up kit for each type and color of materials provided.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" Article of this section.

1.9 MOCK-UPS

A. Provide full size base cabinet complete with drawers, door, adjustable shelf and countertop.

B. See Section 01 40 00 - Quality Requirements for additional requirements.

C. Locate where directed.

D. Mock-up may remain as part of the work.

1.10 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion, at no additional cost to Government. Defects include, but are not limited to:

1. Ruptured, cracked, or stained finish coating.
2. Discoloration or lack of finish integrity.
3. Cracking or peeling of finish.
4. Delamination of components.
5. Failure of adhesives.
6. Failure of hardware.

PART 2 PRODUCTS

2.1 CASEWORK, GENERAL

A. Quality Standard: AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Types: More than one type is required. See drawings for location of each type of casework.

C. Wood Veneer Faced Cabinets: Custom Grade.

2.2 FABRICATION

A. Assembly: Shop assemble casework items for delivery to site in units easily handled and to permit passage through building openings.

B. Construction: As required for selected grade.

C. Structural Performance: Safely support the following minimum loads:

1. Base Units: 500 pounds per linear foot across the cabinet ends.
2. Drawers: 125 pounds, minimum.
3. Hanging Wall Cases: 300 pounds.
4. Shelves: 100 pounds, minimum.

D. Fittings and Fixture Locations: Cut and drill components for fittings and fixtures.

E. Hardware Application: Factory-machine casework members for hardware that is not surface applied.

F. Access Panels: Where indicated, for maintenance of utility service and mechanical and electrical components.

G. Fixed panels at backs of open spaces between base cabinets.

1. Provide cutouts for power receptacles where indicated on drawings.

H. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

I. Scribes and Fillers: Panels of matching construction and finish, for locations where cabinets do not fit tight to adjacent construction.

J. Matching Wood Grain: Comply with requirements of quality standard for specified grade and as follows:

2.3 WOOD-VENEER-FACED CASEWORK

A. Wood-Veneer-Faced Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets.

1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
3. Finishes:
   a. Exposed Exterior Surfaces: HPVA HP-1 Grade A, Ash, plain sliced, random-matched.
   b. Semi-Exposed Surfaces: HPVA HP-1 Grade B, Ash, plain sliced, random-matched.
   c. Concealed Surfaces: Manufacturer's option.

2.4 COUNTERTOPS

A. Types: More than one type is required. See drawings for location of each type of countertop.

B. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Custom Grade, unless otherwise noted.

C. Epoxy Resin Countertops: Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.

1. Manufacturer's standard configuration for exposed edges, back and end splashes.
2. Fabricate in accordance with manufacturer's standard requirements.

D. Solid Surfacing Countertops: Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
2. Manufacturer's standard configuration for exposed edges, back and end splashes.
3. Fabricate in accordance with manufacturer's standard requirements.

2.5 CABINET HARDWARE

A. Manufacturer's standard types, styles and finishes.

2.6 MATERIALS

A. Adhesives Used for Assembly: Comply with VOC requirements for adhesives and sealants; see Section 01 61 16.

B. Wood-Based Materials:

1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.

C. Solid Wood: Clear, dry, sound, plain sawn, selected for compatible species, grain and color, no defects.

D. Semi-Exposed Solid Wood: Dry, sound, plain sawn, no appearance defects, any species similar in color and grain to exposed portions.

E. Hardwood Plywood: Veneer core; HPVA HP-1 Grade as indicated; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.

F. Concealed Solid Wood or Plywood: Any species and without defects affecting strength or utility.

G. Hardwood Edgebanding: Use solid hardwood edgebanding matching species, color, grain, and grade for exposed portions of cabinetry.

2.7 ACCESSORIES

A. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel finish in exposed locations.

B. Concealed Joint Fasteners: Corrosion-resistant, standard with manufacturer.

C. Grommets: Standard painted metal or rubber grommets for cut-outs, in color to match adjacent surface.

D. Sealant for Use in Casework Installation:

1. Manufacturer's recommended type.

PART 3 EXECUTION

3.1 PREPARATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

3.2 EXAMINATION

A. Site Verification of Environmental Conditions:

1. Do not deliver casework until the following conditions have been met:
   a. Building has been enclosed (windows and doors sealed and weather-tight).
   b. An operational HVAC system that maintains temperature and humidity at occupancy levels has been put in place.
   c. Ceiling, overhead ductwork, piping, and lighting have been installed.
   d. Installation areas do not require further “wet work” construction.

B. For Base Cabinets Installation: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 1/2 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.

C. For Wall Cabinets Installation: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:

1. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inchper story.
2. Maximum Variation of finished gypsum board surface from true flatness: 1/8 inch in 10 feet in any direction.

D. Verify adequacy of support framing and anchors.

E. Verify that service connections are correctly located and of proper characteristics.

3.3 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Install hardware uniformly and precisely.

H. Countertops: Install countertops intended and furnished for field installation in one true plane, with ends abutting at hairline joints, and no raised edges.

I. Replace units that are damaged, including those that have damaged finishes.

3.4 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.5 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.6 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent workmen from standing on, or storing tools and materials on casework or countertops.

C. Repair damage, including to finishes, that occurs prior to Date of Substantial Completion, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 12 32 00

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SECTION 12 35 53.19 - WOOD LABORATORY CASEWORK

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

1.2 DEFINITIONS

A. Exposed: Portions of casework visible when drawers and cabinet doors are closed, including end panels, bottoms of cases more than 42 inches above finished floor, tops of cases less than 72 inches above finished floor and all members visible in open cases or behind glass doors.

B. Semi-Exposed: Portions of casework and surfaces behind solid doors, tops of cases more than 72 inches above finished floor and bottoms of cabinets more than 30 inches but less than 42 inches above finished floor.

C. Concealed: Sleepers, web frames, dust panels and other surfaces not generally visible after installation and cabinets less than 30 inches above finished floor.

1.3 REFERENCE STANDARDS

A. BHMA A156.9 - Cabinet Hardware; 2020.

B. HPVA HP-1 - American National Standard for Hardwood and Decorative Plywood; 2024.

C. SEFA 3 - Laboratory Work Surfaces; 2020.

D. SEFA 7 - Laboratory Fixtures; 2021.

E. SEFA 8W - Laboratory Grade Wood Casework; 2020.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Component dimensions, configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.

C. Shop Drawings: Indicate casework types, sizes, and locations, using large scale plans, elevations, and cross sections. Include rough-in and anchors and reinforcements placement dimensions and tolerances, clearances required, and utility locations, if any. Include coordinated information for laboratory equipment specified in another section and/or furnished by Owner.

D. Samples For Color Selection: Wood samples, fully finished, for color and species selection. Minimum Sample Size: 2 inches by 3 inches.

E. Maintenance Data: Manufacturer's recommendations for care and cleaning.

F. Finish touch-up kit for each type and color of materials provided.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect items provided by this section, including finished surfaces and hardware items during handling and installation. For metal surfaces, use polyethylene film or other protective material standard with the manufacturer.

B. Acceptance at Site:

1. Do not deliver or install casework until the conditions specified under Part 3, Examination Article of this section have been met. Products delivered to sites that are not enclosed and/or improperly conditioned will not be accepted if warping or damage due to unsatisfactory conditions occurs.

C. Storage:

1. Store casework in the area of installation. If necessary, prior to installation, temporarily store in another area, meeting the environmental requirements specified under Part 3, "Site Verification of Conditions" paragraph of this section.

1.7 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Correct defective work within a five year period after Date of Substantial Completion, at no additional cost to Government. Defects include, but are not limited to:

1. Ruptured, cracked, or stained finish coating.
2. Discoloration, or lack of finish integrity.
3. Cracking or peeling of finish.
4. Failure of hardware.

PART 2 PRODUCTS

2.1 WOOD LABORATORY CASEWORK

A. Wood Laboratory Casework: Solid wood and wood panel construction; each unit self-contained and not dependent on adjacent units or building structure for rigidity; in sizes necessary to avoid field cutting except for scribes and filler panels. Include adjustable levelers for base cabinets. See below for salient characteristics.

1. Style: Flush overlay. Ease doors and drawer fronts slightly at edges.
2. Cabinet Nominal Dimensions: Unless otherwise indicated, provide cabinets of widths and heights indicated on drawings, and with following front-to-back dimensions:
   a. Base Cabinets: 22 inches.
   b. Tall Cabinets: 22 inches.
   c. Upper Cabinets: 16 inches.
3. Construction: Joints doweled, glued and screwed, except drawers may be lock-shoulder jointed; with interior of units smooth and flush; cabinet bottom flush with top of face frame; without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.

4. Structural Performance: In addition to the requirements of SEFA 3, SEFA 7, and SEFA 8W, components safely support the following minimum loads:
   a. Base Units: 500 pounds per linear foot across the cabinet ends.
   b. Suspended Units: 300 pounds static load.
   c. Tables: 300 pounds, minimum, on four legs.
   d. Drawers: 125 pounds, minimum.
   e. Hanging Wall Cases: 300 pounds.
   f. Shelves: 100 pounds, minimum.
5. Factory-finish all exposed and semi-exposed surfaces with the same finish.
   a. Finish Performance: Provide finish on all surfaces having chemical resistance of Level 0 (no change) or Level 1 (slight change of gloss or slight discoloration) according to SEFA 8W and no visible effect when surface is exposed to:
      1) Hot water at temperature between 190 degrees F and 205 degrees F trickled down the test surface at 45 degree angle for 5 minutes.
      2) Constant moisture in the form of 2 by 3 by 1 inch thick cellulose sponge kept continually saturated with water and in contact with test surface for 100 hours.
   b. Preparation: Wood sanded smooth, free from dust and mill marks.
   c. Coating: Clear, superior-quality, chemical-resistant acyclic urethane; applied in accordance with manufacturer instructions, force-dried, sanded and wiped clean.
   d. Coats: Multiple coats as required to achieve minimum 1.5 mil dry film thickness.
   e. Appearance: Clear satin gloss; not cloudy or muddy.

2.2 CABINET HARDWARE

A. Manufacturer's standard types, styles, and finishes.

B. Comply with BHMA A156.9 requirements.

C. Finish of exposed stainless steel components: No.4 finish.

D. Shelves in Cabinets:

1. Shelf Standards and Rests: Vertical standards with rubber button fitted rests, satin chromium plated over nickel on base material.

E. Swinging Doors:

1. Hinges: Offset pin, number as required by referenced standards for width, height, and weight of door.
2. Catches: Magnetic.
3. Pulls: Chrome wire pulls, 4 inches wide.
4. Drawers:
   a. Pulls: Chrome wire pulls, 4 inches wide.
   b. Slides: Steel, full extension arms, ball bearings; self-closing; capacity as recommended by manufacturer for drawer height and width.

2.3 COUNTERTOPS

A. Countertops: See Section 12 36 00.

2.4 MATERIALS

A. Wood-Based Materials:

1. Solid Wood: Air-dried to 4.5 percent moisture content, then tempered to 6 percent moisture content before use.
2. Composite Wood Panels: Containing no urea-formaldehyde resin binders.

B. Exposed Solid Wood: Clear, dry, sound, plain sawn, selected for compatible grain and color, no defects.

C. Exposed Hardwood Plywood: Veneer core; HPVA HP-1 Grade AA, Type I; same species as exposed solid wood, clear, compatible grain and color, no defects. Band exposed edges with solid wood of same species as veneer.

PART 3 EXECUTION

3.1 INSTALLATION

A. Large Components: Ensure that large components can be moved into final position without damage to other construction.

B. Use anchoring devices to suit conditions and substrate materials encountered. Use concealed fasteners to the greatest degree possible. Use exposed fasteners only where allowed by approved shop drawings, or where concealed fasteners are impracticable.

C. Set casework items plumb and square, securely anchored to building structure.

1. Base Cabinets: Examine floor levelness and flatness of installation space. Do not proceed with installation if encountered floor conditions required more than 3/4 inch leveling adjustment. When installation conditions are acceptable, for each space, establish the high point of the floor. Set and make level and plumb first cabinet in relation to this high point.
2. Wall Cabinets: Examine wall surfaces in installation space. Do not proceed with installation if the following conditions are encountered:
    a. Maximum variation from plane of masonry wall exceeds 1/4 inch in 10 ft and 1/2 inch in 20 ft or more, and/or maximum variation from plumb exceeds 1/4 inch per story.
    b. Maximum Variation of finished gypsum board surface from true flatness exceeds 1/8 inch in 10 feet in any direction.

D. Align cabinets to adjoining components, install filler and/or scribe panels where necessary to close gaps.

E. Fasten together cabinets in continuous runs, with joints flush, uniform and tight. Misalignment of adjacent units not to exceed 1/16 inch. In addition, do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet.
2. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
3. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch.
4. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

F. Base Cabinets: Fasten cabinets to service space framing and/or wall substrates, with fasteners spaced not more than 16 inches on center. Bolt adjacent cabinets together with joints flush, tight, and uniform.

G. Wall Cabinets: Fasten to hanging strips, and/or wall substrates. Fasten each cabinet through back, near top, at not less than 16 inches on center.

H. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

I. Countertops: Install countertops in one true plane, with ends abutting at hairline joints, and no raised edges.

J. Replace units that are damaged, including those that have damaged finishes.

3.2 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures to function smoothly.

3.3 CLEANING

A. Clean casework and other installed surfaces thoroughly.

3.4 PROTECTION

A. Do not permit finished casework to be exposed to continued construction activity.

B. Protect casework and countertops from ongoing construction activities. Prevent installers from standing on or storing tools and materials on casework or countertops.

C. Repair damage that occurs prior to Date of Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION 12 35 53.19

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SECTION 12 36 00 - COUNTERTOPS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework.

C. Sinks molded into countertops.

D. Epoxy resin sinks.

1.2 RELATED REQUIREMENTS

A. Section 06 41 00 - Architectural Wood Casework.

B. Section 12 32 00 - Manufactured Wood Casework.

C. Section 12 35 53.19 - Wood Laboratory Casework: Laboratory countertops.

D. Section 22 40 00 - Plumbing Fixtures: Sinks.

1.3 REFERENCE STANDARDS

A. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2018.

B. AWI (QCP) - Quality Certification Program; Current Edition.

C. ISFA 2-01 - Classification and Standards for Solid Surfacing Material; 2013.

D. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

E. PS 1 - Structural Plywood; 2009.

F. SEFA 2 - Installations; 2010.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Specimen warranty.

B. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

C. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, minimum size 6 inches square, representing actual product, color, and patterns.

E. Test Reports: Chemical resistance testing, showing compliance with specified requirements.

F. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

G. Installation Instructions: Manufacturer's installation instructions and recommendations.

H. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:

1. Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section: www.awiqcp.org/#sle.
2. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
3. Provide designated labels on shop drawings as required by certification program.
4. Provide designated labels on installed products as required by certification program.
5. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 COUNTERTOPS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

B. Epoxy Resin Countertops (EC-1): Filled epoxy resin molded into homogenous, non-porous sheets; no surface coating and color and pattern consistent throughout thickness; with integral or adhesively seamed components.

1. Manufacturers:
   a. Basis of Design: Durcon, Inc, (A Wilsonart Company): www.durcon.com/#sle.
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.
2. Flat Surface Thickness: 3/4 inch, nominal.
3. Chemical-Resistance: Provide products that resist the following chemicals with not more than Moderate Effect when tested in accordance with NEMA LD 3:
4. Flammability: Self-extinguishing, when tested in accordance with ASTM D635.
5. Surface Finish: Smooth, non-glare.

6. Color: As Scheduled in drawings.
7. Back and End Splashes: Same material, same thickness; separate for field attachment.
8. Sinks: Same material, black color; molded in one piece for undercounter mounting; bottom sloped to outlet; molded outlets; drain outlet located in back corner.
    a. Sides and Ends: 1/2 inch minimum thickness.
    b. Bottoms: 5/8 inch minimum thickness.
    c. Interior Corners: 1 inch minimum radius.
    d. Clamping collars for 1-1/2 or 2 inch diameter waste pipe, for sealed but not permanent connection.
    e. Steel channel supports front to back on each side, fastened to underside of top to support twice full sink weight.
9. Countertop Integral Sink Drainage rack.
10. Associated Reagent Shelves and Ledges: Same material.
    a. Thickness: 3/4 inch.
11. Associated Window Sills: Same material.
    a. Thickness: 3/4 inch.
12. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
13. Fabricate in accordance with manufacturer's standard requirements.

C. Solid Surfacing Countertops (SSM-1): Solid surfacing sheet or plastic resin casting over continuous substrate.

1. Flat Sheet Thickness: 1/2 inch, minimum.
2. Solid Surfacing Sheet and Plastic Resin Castings: Complying with ISFA 2-01 and NEMA LD 3; acrylic or polyester resin, mineral filler, and pigments; homogenous, non-porous and capable of being worked and repaired using standard woodworking tools; no surface coating; color and pattern consistent throughout thickness.
    a. Manufacturers:
        1) Basis of Design: LX HAUSYS; HIMACS.
        2) Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.
    b. NSF approved for food contact.
    c. Finish on Exposed Surfaces: Matte, gloss rating of 5 to 20.
    d. Color and Pattern: As indicated on drawings.
3. Other Components Thickness: 1/2 inch, minimum.
4. Exposed Edge Treatment: Built up to minimum 1-1/4 inch thick; square edge; use marine edge at sinks.
5. Back and End Splashes: Same sheet material, square top; minimum 4 inches high.
6. Fabricate in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 11 - Countertops, Premium Grade.
7. Fabricate in accordance with manufacturer's standard requirements.

2.2 MATERIALS

A. Wood-Based Components:

1. Wood fabricated from old growth timber is not permitted.
2. Provide sustainably harvested wood, certified or labeled as specified in Section 01 60 00 - Product Requirements.
3. Provide wood harvested within a 500 mile radius of the project site.

B. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch thick; join lengths using metal splines.

C. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

2.3 FABRICATION

A. Fabricate tops and splashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch except where top butts against cabinet or wall.
3. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.

1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
2. Height: 4 inches, unless otherwise indicated.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Contracting Officer of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install laboratory worksurface countertops in compliance with requirements of SEFA 2.

B. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

C. Attach epoxy resin countertops using compatible adhesive.

D. Seal joint between back/end splashes and vertical surfaces.

3.4 TOLERANCES

A. Variation From Horizontal: 1/8 inch in 10 feet, maximum.

B. Offset From Wall, Countertops: 1/8 inch maximum; 1/16 inch minimum.

C. Field Joints: 1/8 inch wide, maximum.

3.5 CLEANING

A. Clean countertops surfaces thoroughly.

3.6 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 36 00

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SECTION 21 00 50 - COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Above ground piping.

B. Escutcheons.

C. Fire rated enclosures.

D. Mechanical couplings.

E. Pipe hangers and supports.

F. Pipe sleeves.

G. Pipe sleeve-seal systems.

H. Pressure gauges.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior fire protection piping systems.

C. Section 09 91 23 - Interior Painting: Preparation and painting of interior fire protection piping systems.

D. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

E. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment: Seismic and Vibration design requirements for piping and equipment, including Delegated Designs for seismic and wind restraints.

F. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment: Piping identification.

G. Section 21 13 00 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME A112.18.1 - Plumbing Supply Fittings; 2024.

C. ASME B40.100 - Pressure Gauges and Gauge Attachments; 2013.

D. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.

E. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

F. ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.

G. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250; 2021.

H. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

I. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

J. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

K. ASTM A135/A135M - Standard Specification for Electric-Resistance-Welded Steel Pipe; 2021.

L. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

M. ASTM A795/A795M - Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.

N. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

O. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

P. AWWA C110/A21.10 - Ductile-Iron and Gray-Iron Fittings; 2021.

Q. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

R. AWWA C151/A21.51 - Ductile-Iron Pipe, Centrifugally Cast; 2023.

S. AWWA C606 - Grooved and Shouldered Joints; 2022.

T. FM (AG) - FM Approval Guide; Current Edition.

U. ITS (DIR) - Directory of Listed Products; Current Edition.

V. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

W. NFPA 14 - Standard for the Installation of Standpipe and Hose Systems; 2024.

X. UL 393 - Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section.

1. Minimum three years experience.

C. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store valves in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

1.6 WARRANTY

A. See Section 01 78 00 - Closeout Submittals for additional warranty requirements.

1.7 ELECTRICAL SYSTEMS INTERFACE

A. All control wiring and associated raceway systems serving fire sprinkler systems shall be provided under Division 21 unless specifically shown on Electrical drawings or Division 26, 27, or 28 specifications.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Sprinkler-based System:

1. Comply with NFPA 13.
2. See Section 21 13 00.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX.

C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.2 ABOVE GROUND PIPING

A. Steel Pipe: ASTM A795 Schedule 10, ASTM A53 Schedule 40, ASTM A135/A135M Schedule 10, or ASTM A795 Schedule 40, black.

1. Pipe Schedules:
   a. Pipe Size Less Than 3" Dia.: Sch. 40
   b. Pipe Size 3" Dia. or Greater: Sch 10
2. Steel Fittings: ASME B16.5 steel flanges and fittings.
3. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
4. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
5. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

B. Ductile Iron Pipe: AWWA C151/A21.51.

1. Fittings: AWWA C110/A21.10, standard thickness.
2. Joints: AWWA C111/A21.11, SBR or vulcanized styrene-butadiene rubber gasket.
3. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped composition sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.3 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.
2. Provide sealant for watertight joint.

3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc-coated or cast-iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Contracting Officer.

E. Clearances:

1. Provide sleeves for all penetrations, and include additional allowance for insulated piping as applicable.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: Two pipe sizes greater than external pipe diameter.
3. Rated Openings: Caulked tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.4 PIPE SLEEVE-SEAL SYSTEMS

A. Modular Mechanical Seals:

1. Elastomer-based interlocking links to continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.
4. Service Requirements:
   a. Corrosion resistant.
   b. Oil, fuel, gas, and solvent resistant, when installed in locations where these chemicals will be present.
   c. Underground, buried, and wet conditions.

B. Wall Sleeve: Steel material with waterstop collar, and nailer end caps.

C. Sleeve-Forming Disk: Nonconductive plastic-based material, 3 inch thick.

D. Pipeline-Casing Seals:

1. End Seals: 1/8 inch, pull-on type or self-curing wrap-around type, rubber or synthetic rubber based.

2.5 FIRE-RATED ENCLOSURES

A. Provide materials, assemblies, and installation procedures to preserve fire resistance rating of building elements.

2.6 ESCUTCHEONS

A. Material:

1. Fabricate from nonferrous metal.
2. Metals and Finish: Comply with ASME A112.18.1.

B. Construction:

1. One-piece for mounting on chrome-plated piping.
2. Internal spring tension devices or setscrews to maintain a fixed position against a surface.

2.7 PIPE HANGERS AND SUPPORTS

A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

B. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.

C. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.

D. Wall Support for Pipe Sizes to 3 inches: Cast iron hook.

E. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp.

F. Vertical Support: Steel riser clamp.

G. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

H. Seismic Hangers and Couplings:

1. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units, and to protect similar exterior-mounted components and equipment against the effects of high velocity winds. See Structural drawings for project Seismic Design Classification and for Wind Design Classification. See Architectural and Structural drawings for expansion joint locations and details.
2. Delegated Design Documents: Prepare and submit all information required for plan review and permitting by Authority Having Jurisdiction (AHJ), including but not limited to floor plans, details, and calculations.

2.8 MECHANICAL COUPLINGS

A. Rigid Mechanical Couplings for Grooved Joints:

1. Dimensions and Testing: Comply with AWWA C606.
2. Minimum Working Pressure: 300 psig.
3. Housing Material: Fabricate of ductile iron complying with ASTM A536.
4. Housing Coating: Factory applied orange enamel
5. Gasket Material: EPDM suitable for operating temperature range from minus 30 degrees F to 230 degrees F.
6. Bolts and Nuts: Hot-dipped-galvanized or zinc-electroplated steel.

2.9 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and foreign material, from inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.

B. Install standpipe piping, hangers, and supports in accordance with NFPA 14.

C. Install all equipment, piping, and accessories in accordance with manufacturer's instructions.

D. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

E. Install piping to conserve building space, to not interfere with use of space and other work.

F. Group piping whenever practical at common elevations.

G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Coordinate with Architectural and Structural drawings and specifications to determine locations and requirements of building expansion joints.

H. Pipe Hangers and Supports:

1. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
2. Place hangers within 12 inches of each horizontal elbow.
3. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
6. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed unless project is located in a coastal environment.
    a. Painting of interior fire suppression systems is specified in Section 09 91 23.
    b. Painting of exterior fire suppression systems is specified in Section 09 91 13.

I. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.

J. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

1. Painting of interior fire suppression systems is specified in Section 09 91 23.
2. Painting of exterior fire suppression systems is specified in Section 09 91 13.

K. Structural Considerations:

1. Do not penetrate building structural members unless specifically indicated on the Structural drawings.
2. Locate flexible expansion loops at or near the building seismic/expansion joint.

L. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
   a. Pack solid using mineral fiber complying with ASTM C592.
   b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
   c. Exterior locations shall use corrosion-resistant piping and materials with dielectric fittings and connections.
3. All Rated Openings: Caulk tight with firestopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
4. Caulk exterior wall sleeves watertight with mechanically expandable chloroprene inserts with mastic-sealed components.

M. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a watertight seal.
6. Install in accordance with manufacturer's recommendations.

N. Escutcheons:

1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
3. Attach plates at the underside of suspended ceilings.
4. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.

O. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

3.3 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 21 00 50

SECTION 21 05 23 - GENERAL-DUTY VALVES FOR WATER-BASED FIRE-SUPPRESSION PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Bronze butterfly valves with indicators.

B. Iron butterfly valves with indicators.

C. NRS gate valves.

D. Trim and drain valves.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

1.3 ABBREVIATIONS AND ACRONYMS

A. EPDM: Ethylene-propylene diene monomer.

B. NRS: Non-rising stem.

C. PTFE: Polytetrafluoroethylene.

1.4 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.42 - Ductile Iron Pipe Flanges and Flanged Fittings: Classes 150 and 300; 2021.

D. AWWA C606 - Grooved and Shouldered Joints; 2022.

E. FM (AG) - FM Approval Guide; Current Edition.

F. FM 1112 - Examination Standard for Indicating Valves (Butterfly or Ball Type); 2020.

G. FM 1120/1130 - Approval Standard for Fire Service Water Control Valves (OS&Y and NRS Gate Valves); 1997.

H. FM 1140 - Approval Standard for Quick Opening Valves 1/4 Inch through 2 Inch Nominal Size; 1998.

I. FM 1210 - Approval Standard for Swing Check Valves; 2004.

J. UL (DIR) - Online Certifications Directory; Current Edition.

K. UL 258 - Shutoff Valves for Trim and Drain Purposes for Fire Protection Service; Current Edition, Including All Revisions.

L. UL 262 - Gate Valves for Fire-Protection Service; Current Edition, Including All Revisions.

M. UL 312 - Check Valves for Fire-Protection Service; Current Edition, Including All Revisions.

N. UL 1091 - Standard for Butterfly Valves for Fire-Protection Service; Current Edition, Including All Revisions.

1.5 QUALITY ASSURANCE

A. Where listed products are specified, provide products listed, certified, and labeled by FM (AG), UL (DIR), or testing firm acceptable to authorities having jurisdiction as suitable for purpose indicated.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Source Limitations: Furnish valves of same kind by same manufacturer.

B. Valve-End Connections:

1. Flanges on Iron Valves: ASME B16.1 or ASME B16.42.
2. Threaded Ends: ASME B1.20.1.
3. Grooved Ends: AWWA C606.

C. Valve Pressure Ratings: Not less than minimum pressure rating indicated or higher as required.

D. Valve Sizes: Same as upstream piping unless otherwise indicated.

E. Valve Actuator Types:

1. Worm-gear actuator with handwheel for quarter-turn valves, except trim and drain valves.
2. Handwheel: For other than quarter-turn trim and drain valves.
3. Hand-lever: For quarter-turn trim and drain valves 2 NPS and smaller.

F. UL 1091 and FM 1112 listed.

1. Supervisory Switch: Internal or external.

2.2 BRONZE BUTTERFLY VALVES WITH INDICATORS

A. UL 1091 and FM 1112 listed.

B. Minimum Pressure Rating: 175 psig.

C. Body Material: Bronze.

D. Seat: EPDM.

E. Stem: Bronze or stainless steel.

F. Disc: Bronze with EPDM coating or stainless steel.

G. Actuator: Worm gear or traveling nut.

H. End Connections: Threaded or grooved.

2.3 IRON BUTTERFLY VALVES WITH INDICATORS

A. UL 1091 and FM 1112 listed.

B. Minimum Pressure Rating: 175 psig.

C. Body Material: Cast or ductile iron with EPDM or epoxy coating.

D. Seat: EPDM.

E. Stem: Stainless steel.

F. Disc: Ductile iron with EPDM coating.

G. Actuator: Worm gear or traveling nut.

H. Supervisory Switch: Internal or external.

I. Body Design: Grooved-end or wafer style.

J. UL 312 and FM 1210 listed.

K. Body Material: Cast or ductile iron.

L. Clapper: Bronze, EPDM-coated ductile iron, or stainless steel.

M. Seat: Bronze or EPDM-coated bronze.

N. End Connections: Flanged.

2.4 IRON NRS GATE VALVES

A. UL 262 and FM 1120/1130 listed.

B. Minimum Pressure Rating: 175 psig.

C. Body and Bonnet Material: Cast or ductile iron.

D. Wedge: Cast or ductile iron with elastomeric coating.

E. Stem: Brass or bronze.

F. Packing: Non-asbestos PTFE.

G. Operation:

1. Operating nut for post-indicating valves.
2. Handwheel for non-post-indicating valves.

H. Post Plate: Provide for post-indicating valves.

I. End Connections: Flanged.

2.5 TRIM AND DRAIN VALVES

A. Ball Valves:

1. Description:
   a. UL 258 or FM 1140 listed.
   b. Pressure Rating: 175 psig.
   c. Body Design: Two piece.
   d. Body Material: Forged brass or bronze.
   e. Port Size: Full or standard.
   f. Seat: PTFE.
   g. Stem: Bronze or stainless steel.
   h. Ball: Chrome-plated brass.
   i. Actuator: Hand-lever.
   j. End Connections: Threaded or grooved.

PART 3 EXECUTION

3.1 EXAMINATION

A. Confirm valve interior to be free of foreign matter and corrosion.

B. Remove packing materials.

C. Examine guides and seats by operating valves from the fully open position to the fully closed position.

D. Examine valve threads and mating pipe for form and cleanliness.

E. Examine mating flange faces for conditions that might cause leakage.

1. Check bolting for proper size, length, and material.
2. Verify gasket for size, defects, damage, and suitable material composition for service.
3. Replace defective valves with new valves.

3.2 INSTALLATION

A. Install valves in accessible locations to allow for operation, inspections, tests, and maintenance.

B. Install listed valves in accordance with their listing.

C. Install valves in accordance with manufacturer's instructions.

D. Support valves independently of adjacent piping.

E. Install valves in horizontal piping with stem at or above pipe center.

F. Position valves to allow full actuator movement.

G. Install OS&Y valves with full clearance for rising stem. Install surrounding components so they do not interfere with nor are they impacted by full extension of rising stem.

H. Install supervised shutoff valves in supervised-open position.

1. Install permanent identification signs indicating portion of system controlled by each shutoff valve.
2. Install threaded-end valves with unions upstream and downstream.

I. Install valve tags. See Section 21 05 53. Label valves in accordance with NFPA standard applying to the piping system in which valves are installed.

END OF SECTION 21 05 23

SECTION 21 05 48 - VIBRATION AND SEISMIC CONTROLS FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Seismic restraint systems

1.2 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

B. Section 03 30 00 - Cast-in-Place Concrete.

1.3 DEFINITIONS

A. Fire Suppression Component: Where referenced in this section in regards to seismic controls, applies to any portion of the fire suppression system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4 REFERENCE STANDARDS

A. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

B. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

C. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

D. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

E. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

F. FM 1950 - Examination Standard for Seismic Sway Braces for Pipe, Tubing and Conduit; 2023.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).

I. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

K. UL 203A - Standard for Sway Brace Devices for Sprinkler System Piping; Current Edition, Including All Revisions.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate selection and arrangement of vibration isolation and/or seismic control components with the actual equipment to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Seismic Controls:
   a. Coordinate the arrangement of seismic restraints with piping, conduit, equipment, and other potential conflicts installed under other sections or by others.
   b. Coordinate the work with other trades to accommodate relative positioning of essential and nonessential components in consideration of seismic interaction.
5. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.6 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submittal 21 05 48.01:

1. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.
2. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.
   a. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
   b. Seismic Controls: Include seismic load capacities.
3. Seismic Design Data:
   a. Compile information on project-specific characteristics of actual installed fire suppression components necessary for determining seismic design forces required to design appropriate seismic controls.
   b. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

1.7 QUALITY ASSURANCE

A. Comply with ICC (IBC).

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

1. Designer may be employed by the manufacturer of the seismic restraint products.

D. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing fire suppression equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:

1. Equipment Type: All.
   a. Mounting: Vibration-isolated structural steel base.
   b. Isolator Type (Seismic Application): Seismic type restrained spring isolators.

E. Piping Isolation:

1. Use flexible piping connections to vibration-isolated equipment.

2.2 SEISMIC CONTROL REQUIREMENTS

A. Design and provide fire suppression component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor fire suppression components.

B. Seismic Design Criteria: Obtain from project Structural Engineer of Record.

C. Component Importance Factor (Ip): Fire suppression components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Qualification of Equipment:

1. Provide special certification for fire suppression equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
3. Notify Contracting Officer and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Premanufactured Modular Fire Suppression Equipment: Where not otherwise seismically qualified, premanufactured modules 6 feet high and taller furnished under other sections to be designed in accordance with seismic provisions for nonbuilding structures.

F. Seismic Restraints:

1. Provide seismic restraints for fire suppression components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions, All Seismic Design Categories:
   a. Fire Suppression Piping Exemptions, All Seismic Design Categories:
      1) Lateral sway bracing for piping individually supported within 6 inches of the structure measured between the top of pipe and the point of attachment to the structure, where all conditions for exception specified in NFPA 13 are met.
      2) Lateral sway bracing for branch lines smaller than 2-1/2 inches in diameter, where branch line restraint is provided in accordance with NFPA 13.
3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 412.
   c. FEMA 413.
   d. FEMA 414.
   e. FEMA E-74.
   f. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.

G. Seismic Attachments:

1. Comply with support and attachment requirements of NFPA 13.
2. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.

3. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
4. Do not use powder-actuated fasteners.
5. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

H. Seismic Interactions:

1. Include provisions to prevent seismic impact between fire suppression components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

I. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections, in accordance with NFPA 13, to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.
2. Provide clearance around fire suppression system piping extending through walls, floors, platforms, and foundations in accordance with NFPA 13.

2.3 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

2.4 SEISMIC RESTRAINT SYSTEMS

A. Manufacturers:

1. Source Limitations: Furnish seismic restraint system components and accessories produced by a single manufacturer and obtained from a single supplier.

B. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

C. Where required by NFPA 13, provide products listed as complying with UL 203A or FM 1950.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Government or Contracting Officer in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.

1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:

1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
3. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
4. Verification of required clearances between other equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Government acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:
    a. Provide specified minimum clearance beneath base.
2. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
3. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
4. Adjust isolators to be free of isolation short circuits during normal operation.
5. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
    a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
    b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
    c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
    a. Size in accordance with seismic design to meet anchor requirements.
    b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
    a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
    b. Install restraints within permissible angles in accordance with seismic design.
    c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
    d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
    e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.

D. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

E. Seismic Controls:

1. Verify snubbing element air gaps.

F. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

END OF SECTION 21 05 48

SECTION 21 05 53 - IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

D. Ceiling tacks.

1.2 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.3 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Submittal 21 05 53.1: Product Data

1. Provide manufacturers catalog literature for each product required.
2. Samples: Submit digital samples of labels, including measurement examples of each label type and size to be used in the project.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Automatic Controls: Tags.

B. Control Panels: Nameplates.

C. Instrumentation: Tags.

D. Major Control Components: Nameplates.

E. Piping: Pipe markers.

F. Pumps: Nameplates.

G. Relays: Tags.

H. Small-sized Equipment: Tags.

I. Thermostats: Nameplates.

J. Valves: Tags and ceiling tacks where above lay-in ceilings.

2.2 NAMEPLATES

A. Description: Laminated three-layer plastic or Bakelite with engraved letters.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.
4. Thickness: 1/8 inch.

5. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Metal Tags: Stainless Steel with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

B. Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

2.4 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Underground Plastic Pipe Markers: Bright-colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil, 0.004 inch thick, manufactured for direct burial service.

D. Color code as follows:

1. Fire Quenching Fluids: Red with white letters.

2.5 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. Sprinkler Valves: Red.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install all products in accordance with manufacturer's instructions.

B. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

C. Install tags with corrosion resistant chain.

D. Install plastic tape pipe markers complete around pipe.

E. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.

F. Use tags on piping 3/4 inch diameter and smaller.

1. Identify service and flow direction.
2. Install in clear view and align with axis of piping.
3. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

G. Locate ceiling tacks to locate valves above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 21 05 53

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SECTION 21 13 00 - FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Dry-pipe sprinkler system.

B. System design, installation, and certification.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 21 00 50 - Common Work Results for Fire Suppression: Pipe and fittings.

C. Section 21 05 23 - General-Duty Valves for Water-Based Fire-Suppression Piping.

D. Section 21 05 48 - Vibration and Seismic Controls for Fire Suppression Piping and Equipment.

E. Section 21 05 53 - Identification for Fire Suppression Piping and Equipment.

F. Section 28 46 00 - Fire Detection and Alarm.

1.3 REFERENCE STANDARDS

A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

B. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

C. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

D. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 1963 - Standard for Fire Hose Connections; 2019.

F. UL 405 - Standard for Safety Fire Department Connection Devices; Current Edition, Including All Revisions.

G. NPS Reference Manual 58

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

B. PRECONSTRUCTION:

1. Submittal 21 13 00.01: Product Data & Shop Drawings
   a. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings and weights.
   b. Shop Drawings:
      1) Submit preliminary layout of finished ceiling areas indicating only sprinkler locations coordinated with ceiling installation.
      2) Provide new water flow test report completed within the last 6 months. Do not reuse water flow test report on drawings for final design calculations.

3) Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls. Hydraulic calculations shall include an allowance for inside and outside hose streams.

2. Submittal 21 13 00.02: Approved Shop Drawings (For Information)
   a. Submit shop drawings to Authorities Having Jurisdiction for approval. Shop Drawings must be stamped by a Fire Protection Engineer. Submit proof of approval to Contracting Officer.

C. CLOSEOUT:

1. Submittal 21 13 00.03: Operation and Maintenance Data:
   a. Include components of system, servicing requirements, record drawings, inspection data, replacement part numbers and availability, and location and numbers of service depot.
2. Submittal 21 13 00.04: Maintenance Materials
   a. Furnish the following for Government's use in maintenance of project.
      1) See Section 01 60 00 - Product Requirements for additional provisions.
      2) Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
      3) Sprinkler Wrenches: For each sprinkler type.
3. Submittal 21 13 00.05: Project Record Documents:
   a. Record actual locations of sprinklers and deviations of piping from drawings. Indicate drain and test locations.

1.5 QUALITY ASSURANCE

A. Maintain one copy of referenced design and installation standard on site, or provide digital access .

B. Comply with FM (AG) requirements.

C. Fire Sprinkler Systems shall be designed by individuals meeting one or more of the following requirements per NPS Reference Manual 58:

1. A fire protection engineer.
2. A NICET III technician for the type of system designed.
3. As approved by the FCO.

D. Fire Sprinkler Systems shall be installed by individuals meeting one or more of the following requirements per NPS Reference Manual 58:

1. A fire protection engineer.
2. A NICET Level II installer.
3. As approved by the FCO.

E. Designer Qualifications: Design system under direct supervision of a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

F. Installer Qualifications: Company specializing in performing the work of this section with minimum three years experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in shipping containers and maintain in place until installation. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

PART 2 PRODUCTS

2.1 SPRINKLER SYSTEM

A. Sprinkler System: Provide coverage for building areas as indicated on drawings.

B. Occupancy: as indicated on drawings.

C. Water Supply: Determine volume and pressure from water flow test data.

1. Refer to the flow test information on the drawings for basis of design scope. Do not use this data for final design calculations.
2. Revise design when test data available prior to submittals.

D. Interface system with building fire and smoke alarm system.

E. Provide fire department connections where indicated.

F. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.

G. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:

1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
4. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.2 SPRINKLERS

A. Finishes noted below shall be used unless otherwise noted on Architectural or Fire Protection drawings.

B. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Chrome plated.
4. Escutcheon Plate Finish: Brushed Chrome.
5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

C. Exposed Area Type: Pendant type with guard, or upright if indicated on drawings.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Chrome plated.
4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

D. Sidewall Type: Semi-recessed horizontal sidewall type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Chrome plated.

4. Escutcheon Plate Finish: Brushed Chrome.
5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

E. Dry Sprinklers: Concealed pendant type with matching push on escutcheon plate.

1. Response Type: Quick.
2. Coverage Type: Standard.
3. Finish: Chrome plated.
4. Cover Plate Finish: Brushed Chrome.
5. Fusible Link: Fusible solder link type temperature rated for specific area hazard.

F. Flexible Drop System: Stainless steel, multiple use, open gate type.

1. Application: Use to properly locate sprinkler heads.
2. Include all supports and bracing.
3. Provide braided type tube as required for the application.

2.3 PIPING SPECIALTIES

A. Electric Alarm: Electrically operated chrome plated gong with pressure alarm switch.

B. Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated 10 amp at 125 volt AC and 2.5 amp at 24 volt DC.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with referenced NFPA design and installation standard.

B. Install equipment in accordance with manufacturer's instructions.

C. Install buried shut-off valves in valve box. Provide post indicator.

D. Provide approved reduced pressure principle backflow assembly at sprinkler system water source connection.

E. Locate fire department connection with sufficient clearance from walls, obstructions, or adjacent fittings to allow full swing of fire department wrench handle.

F. Locate outside alarm gong on building wall as indicated on drawings.

G. Place pipe runs to minimize obstruction to other work and to avoid all required equipment access, electrical, and maintenance clearances.

H. Place piping in concealed spaces above finished ceilings.

I. All sprinkler piping shall be routed as high as possible to maintain minimum clear heights of the ceiling, piping, and equipment.

J. Center sprinklers in two directions in ceiling tile and provide piping offsets as required.

K. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.

L. Flush entire piping system of foreign matter.

M. Install guards on sprinklers where indicated.

N. Hydrostatically test entire system.

O. Require test be witnessed by Fire Marshal and Authority Having Jurisdiction (AHJ).

END OF SECTION 21 13 00

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SECTION 22 00 50 - COMMON WORK RESULTS FOR PLUMBING

PART 1 GENERAL

1.1 APPLICABILITY

A. **The instructions outlined in this section shall apply to all sections under Division 22, except where specifically noted otherwise in the individual specification sections.**

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

C. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: Seismic and Vibration design requirements for piping and equipment, including Delegated Designs for seismic and wind restraints.

D. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to and supplement all work specified in Division 22. If conflicts arise, the Contractor shall be responsible for communicating the conflict to the Contracting Officer prior to performing any work or ordering any equipment. **The Plumbing Drawings are diagrammatic. Refer to Architectural, Structural, and Civil drawings for all building dimensions.**

1.3 REFERENCE STANDARDS

A. AWWA C651 - Disinfecting Water Mains; 2023

B. AWWA C652 - Disinfection of Water-Storage Facilities; 2019

1.4 DEFINITIONS

A. Exposed: Revealed to view or subject to weather.

B. Fittings: All connecting pieces of a system.

C. Provide: Furnish, install, and connect completely.

D. Piping: Pipe installed with all required fittings, valves, and accessories, and forming a complete system.

E. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, and accessories completely installed.

1.5 CODES AND STANDARDS

A. **These specifications and associated design drawings do not give permission, implicit or inferred, to ignore the requirements of the applicable building codes or the Authority Having Jurisdiction (AHJ). By placing a bid on this project, Contractor acknowledges and agrees to the requirement that they shall be versed in all applicable code requirements relevant to this specific project, and shall bring any conflicts to the attention of the Contracting Officer prior to performing any work. <u>If work performed is found to be in violation of code, Contractor shall rectify any such work at their own expense.</u>**

1.6 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of all equipment and systems with size, location and installation of service utilities.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner, and that coordination between all affected installers has been performed to ensure proper installation order of all systems (e.g., electrical, mechanical, fire protection, millwork, etc.).

C. The locations, arrangement, and extent of equipment, devices, piping, and other appurtenances related to the installation of the Plumbing work shown on the drawings are approximate and define the intent of the design. Contractor shall not scale the Plumbing drawings but shall refer to the Architectural drawings for exact dimensions of building components. Should a conflict exist between the Architectural and Plumbing drawings regarding dimensions and scale, notify the Contracting Officer of the discrepancy.

1.7 PERMITS, UTILITIES, SERVICES, AND FEES

A. Sanitary: Provide sanitary drainage, connecting to sewer. Make arrangements for and pay all fees in connection with this installation.

B. Water: Provide domestic (City) water, connecting to water mains. Arrange for tap to main and installation of meter. Pay all fees associated with new water service.

C. Obtain all permits, inspections and approvals as required by all Authority Having Jurisdiction (AHJ) and deliver certificates of approval to the Contracting Officer. Assume and pay all fees and costs of any nature whatsoever incidental to these permits.

1.8 EXISTING BUILDINGS

A. Prior to commencing work, scan all existing slab locations to be trenched using a ground-penetrating radar to locate any underground utility lines or structural foundations. Report and coordinate all findings with the Design Professional.

B. Scope existing underground sanitary piping and report any damage and/or sloping issues to the Contracting Officer prior to commencing work.

1.9 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures, for submittal procedures.

B. Plumbing systems and all associated equipment, piping, accessories, and specialties shall not be installed without first coordinating the installation of the same with all other building trades (Architectural, Structural, Mechanical, etc.). **Coordination shall be accomplished prior to, and shall be reflected in, the equipment submittals for approval.**

C. **PRECONSTRUCTION SUBMITTALS:**

1. Submittal 22 00 50.01: Electrical Coordination Statement
   a. Submit a written statement confirming coordination of voltage and power connection requirements for all Plumbing equipment and controls requiring an electrical connection. Statement shall bear the names and signatures of the Plumbing and Electrical subcontractors. Equipment that is connected to incorrect voltages for any reason shall be replaced at Contractor's expense.

D. **CLOSEOUT SUBMITTALS:**

1. Submittal 22 00 50.02: Plumbing Operations Test Reports
    a. Submit Plumbing System Operational Test Report at conclusion of project.
        1) Purging and disinfecting activity reports
        2) Water-sample approvals
2. Submittal 22 00 50.03: Sterilization Test Reports
    a. Submit Sterilization Test Reports in accordance with paragraph "STERILIZATION" below.
        1) Purging and disinfecting activity reports
        2) Water-sample approvals

1.10 QUALITY ASSURANCE

A. Inverts: All inverts shall be verified immediately following award of Contract. All inverts shall be coordinated with Structural footings.

B. Manufacturer Qualifications: Unless specifically noted otherwise in the specifications or drawings, all products shall be manufactured by a company specializing in manufacturing the specific products used in this project, with at least three years of documented experience.

C. Fabricator Qualifications: Unless specifically noted otherwise in the specifications or drawings, a company specializing in fabricating the specific products used in this project, with at least three years of documented experience.

D. Installer Qualifications: Unless specifically noted otherwise in the specifications or drawings, a company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

E. **NOTICE: Manufacturer's Startup Representative Qualifications:** Unless specifically noted otherwise in the specifications or drawings, when the project documents specify startup services by a manufacturer's factory technician or representative, those services may not be delegated to the contractor or subcontractor who performed the installation, but must be provided directly by the manufacturer's personnel or by the manufacturer's contracted independent third party representative.

F. Copies of Documents at Project Site: Maintain at the project site a copy (or provide access to a digital copy) of each referenced document that prescribes execution requirements.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Store all products and equipment under cover and elevated above grade, protected completely against weather. **Do not install materials or equipment in a partially constructed structure exposed to weather**, unless all material and equipment is continuously protected from damage by weather or the construction process. Comply with all manufacturer requirements for safe and effective storage of each product. Where Manufacturer's instructions and these specifications differ, maintain the more stringent standard.

B. Products such as copper piping and fittings that are stored outside must be protected against contamination by the elements within sealed plastic containers, or must be plugged and purged per the manufacturer's recommendations to ensure no damage to the inside of the piping.

C. **Material and equipment with suspected or observable damage caused by improper protection during construction is subject to replacement based on the judgment of Contracting Officer at no cost to Government.**

1.12 ELECTRICAL SYSTEMS INTERFACE

A. All control wiring and associated raceway systems serving plumbing systems shall be provided under Division 22 unless specifically shown on Electrical drawings or Division 26 specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. If substitution of alternate equipment is requested, the Contractor is responsible for any and all costs required by the substitution, including necessary engineering and construction revisions in their – or any – contract or trade to satisfy the design intent shown on the Drawings and described in the Specifications.

B. If the products and equipment used as the basis of design are modified, coordinate with all other trades prior to purchasing any material or equipment. **Such coordination shall occur before purchasing and delivering equipment from the manufacturer and shall be clearly indicated on the shop drawings.** Perform all related modifications without incurring cost to the Contract.

C. Substitutions: See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 MATERIALS

A. All products shall be new and shall bear the Underwriter's Laboratories, Inc. (UL) label or the Factory Mutual Underwriters (FM) label unless specifically indicated otherwise. Furnish materials and equipment compatible with the existing system.

B. Materials, equipment, or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications are not intended to indicate every item of material, equipment, or labor required to produce a complete and properly functioning installation.

C. Piping and insulation located in air plenums shall conform to NFPA 90A requirements. Piping located in shafts that constitute air ducts or that enclose air ducts shall be noncombustible in accordance with NFPA 90A. Installation of plastic pipe where in compliance with NFPA may be installed in accordance with PPFA "Fire Man".

D. **FLAME SPREAD AND SMOKE DEVELOPED RATINGS OF MATERIALS:**

1. Materials and adhesives used throughout the plumbing systems for any system shall have a flame spread rating not over 25, and a smoke developed rating not to exceed 50. If such materials are to be applied with adhesives, test them as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not to exceed 50.

2. Determine flame spread rating and smoke developed rating by the Method of Testing of Surface Burning Characteristics of Building Materials, NFPA 255, ASTM E84, and Underwriters' Laboratories, Inc. standards.

2.3 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

PART 3 EXECUTION

3.1 GENERAL

A. The Plumbing drawings do not give exact location of lines, nor do they show all the offsets, control lines or installation details. Carefully lay out the work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions.

B. Offset valves in piping systems down to within one foot of the access point. Group runs of piping whenever it is feasible to do so.

C. Provide access to equipment and valves requiring operation, service or maintenance within the life of the system. Equipment located above lay-in type ceilings is considered accessible.

3.2 EXAMINATION

A. Verification of Conditions: Verify existing conditions and operability of all existing equipment and systems prior to beginning work.

B. The work shall be carefully laid out in advance, to avoid unnecessary cutting of construction. Damage to building, piping, wiring, or equipment as a result of cutting shall be repaired by workers skilled in the trade(s) involved.

3.3 INSTALLATION

A. Install all equipment and materials in accordance with manufacturer's instructions. Where the manufacturer's instructions and the drawings/specifications conflict, submit an RFI to the Design Professional for resolution.

B. Minor in-field adjustments may be executed to conform to installed or discovered conditions, but all such changes shall be subject to approval by the Contracting Officer and the Government. Unapproved changes shall be rectified at no additional cost to the Contract.

C. Equipment and piping shall be installed in such a manner as to ensure full maintenance access and clearances to service and/or replace each piece of equipment in accordance with the equipment manufacturer's instructions and recommendations.

D. At the discretion of Government, Contracting Officer, or the Authority Having Jurisdiction (AHJ), relocate all conflicts arising from uncoordinated piping, equipment, etc. installed, should such installation be determined to interfere with the proper installation and mounting of equipment, ceilings, piping, conduit, or any other Architectural or Structural systems or finishes. **Corrective work arising from these conditions shall be performed without additional expense to the contract.**

1. Stacking of piping, conduit, etc. where it would cause an obstruction or restricted path for egress or serviceability of equipment from any trade is prohibited.

2. Coordinate the elevations of all piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation. In areas where more than one trade is required to use common openings in structure, joists, chases, shafts, and sleeves to route conduits, raceways, piping, or any other materials, coordinate the positions of all piping and equipment to be furnished under this section so that all items – including the materials and equipment of other trades – may be accommodated within the space available.
3. Confirm that work to be performed under Division 22 does not interfere with the clearances required for finished soffits, columns, millwork, pilasters, partitions, walls, or other Architectural or Structural elements as shown on the Drawings or Specifications. **Work that interferes with the Architectural design or building structure shall be removed and relocated at the direction of the Government or Contracting Officer at no additional cost to the contract.**
4. All piping shall be run tight to structure and routed to follow building lines, regardless of whether piping and equipment are above or below structural elements. Free-standing piping and equipment spanning open spaces or voids is prohibited. All piping routed through areas with exposed ceilings, cloud ceilings, or any other areas where piping may be visible to building occupants shall be routed to maintain a low-profile installation or shall be hidden from view, to provide the least-visible installation possible.
    a. **If any of these conditions are identified in the field by Government, Contracting Officer, or the Authority Having Jurisdiction (AHJ), remove and reinstall the indicated piping, specialties, or equipment in accordance with these directions at no additional cost to the Contract.**
    b. If there are areas where necessary routing cannot comply with these instructions, furnish a sketch to the Contracting Officer identifying such areas and how the design drawing routing in the indicated areas will differ from these instructions, and obtain written approval to proceed with the proposed routing from the Contracting Officer prior to installation.

E. Electrical Clearances: Piping, equipment, or ductwork shall not be installed in electrical equipment rooms, unless such piping serves equipment inside these spaces exclusively. Do not locate or route piping, ductwork, or equipment within 42" in front (and rear, if free-standing) of electrical equipment, or within 36" of sides of equipment. Clearances shall apply from floor level to underside of structural deck, and shall apply to the following electrical equipment:

1. Switchboards
2. Panel boards
3. Power panels
4. Motor control centers
5. Dry-type transformers
6. Electrical disconnects

F. Water and drainage piping shall be extended 5 feet outside the building, unless otherwise indicated. Piping shall be connected to the exterior service lines or capped or plugged if the exterior service is not in place.

G. SEISMIC, WIND, AND EXPANSION JOINT DESIGN

1. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, plumbing fixtures, and equipment, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units, and to protect similar exterior-mounted components and equipment against the effects of high velocity winds. See Structural drawings for project Seismic Design Classification and for Wind Design Classification. See Architectural and Structural drawings for expansion joint locations and details.
2. Delegated Design Documents: Prepare and submit all information required for plan review and permitting by Authority Having Jurisdiction (AHJ), including but not limited to floor plans, details, and calculations.

H. SANITARY AND STORMWATER

1. Sewer and water pipes shall be laid in separate trenches, except when otherwise shown. If trenches are closed or the pipes are otherwise covered before being connected to the service lines, the location of the end of each plumbing utility shall be marked with a stake or other acceptable means.
2. Piping Slopes: Unless noted otherwise, all sanitary waste piping less than 3" shall slope at a minimum of 1/4" per foot, and all Sanitary piping 3" and larger shall slope at a minimum of 1/8" per foot.
3. Provide base cleanout at lowest floor level of all stacks (waste, vent, stormwater, etc.). Exact location of all cleanouts shall be coordinated and approved by Design Professional prior to installation.
4. The minimum size sanitary and vent piping shall be 2 inches, and the minimum size sanitary below floor shall be 3 inches, unless specifically noted otherwise.
5. INDIRECT WASTE:
    a. All indirect waste piping shall discharge through an air gap or air break into a waste receptor.
    b. All indirect waste piping that exceeds two feet, six inches (30 inches) in developed length measured horizontally or four feet, six inches (54 inches) in total developed length shall be trapped.
    c. All indirect waste receptors shall be located where they are readily accessible for inspection and cleaning.
6. Sanitary and storm drain piping, including the underside of roof drain bodies, horizontal runs of storm drain piping, and vertical storm water and sanitary stacks, shall be insulated for the prevention of condensation and for acoustics. See Section 22 07 19 - Plumbing Piping Insulation for details.

I. DOMESTIC WATER

1. The supply line to each item of equipment or fixture shall be equipped with a shutoff valve within 18 inches of the main to enable isolation of the item for repair and maintenance without interfering with operation of other equipment or fixtures, regardless of presence or absence on the drawings.
    a. Exception: Faucets shall be provided with a shutoff valve within 30 inches of the final connection to the fixture.

2. Supply piping to fixtures, faucets, hydrants, shower heads, and flushing devices shall be anchored to prevent movement.
3. Valves shall be installed with control no lower than the valve body.
4. All direct connect appliances shall be individually protected against backflow. Each piece of equipment (e.g., ice machines, coffee makers, and similar equipment with direct connections to potable water) shall be protected by a dedicated backflow preventer conforming to ASSE 1024.
5. Provide automatic air release valves at all high points of domestic hot and cold water systems.

J. Exterior underground utilities shall be at least 6 inches below the average local frost depth or as indicated on the drawings; whichever is deeper.

K. Cover ends of open pipes during construction except when working on such end prohibits covering. Pipe openings shall be closed with caps or plugs during installation. The use of duct tape or similar improvised coverings is not acceptable. Fixtures and equipment shall be tightly covered and protected against dirt, water, chemicals, and mechanical injury. Upon completion of the work, the fixtures, materials, and equipment shall be thoroughly cleaned, adjusted, and operated. Safety guards shall be provided for exposed rotating equipment.

L. Access Panels: Provide access to equipment and valves requiring operation, service or maintenance within the life of the system. Locate such equipment where access will not require installation of access panels wherever possible.

1. If an access panel is required to be installed in hard ceilings, walls, soffits, etc., and is not shown on the Architectural drawings, Contractor shall notify Contracting Officer in writing. Such notification shall include both the specific equipment requiring access, and the proposed location and size of the access panel, and Contractor shall obtain written approval to proceed prior to installation.
2. All access panels shall be located in the least-visible location possible.
3. If written approval for the required access panel location is not obtained prior to installation, Contracting Officer reserves the right to direct Contractor to remove and relocate the equipment or valves requiring access to a less visible location as chosen by Contracting Officer at no additional cost to the Contract.
4. Equipment located above lay-in type ceilings is considered accessible.

M. Expansion and Contraction of Piping: Allowance shall be made throughout for expansion and contraction of water pipe. Each hot-water and hot-water circulation system shall have expansion loops or other provisions such as offsets and changes in direction where indicated.

1. Risers shall be securely anchored to force expansion to loops. Branch connections from risers shall be made with ample swing or offset to avoid undue strain on fittings or short pipe lengths.
2. Horizontal runs of pipe over 50 feet in length shall be anchored to the wall or the supporting construction about midway on the run to force expansion, evenly divided, toward the ends.
3. Sufficient flexibility shall be provided on branch runouts from mains and risers to provide for expansion and contraction of piping.

4. Flexibility shall be provided by installing one or more turns in the line so that piping will spring enough to allow for expansion without straining.
5. If mechanical grooved pipe coupling systems are provided, the deviation from design requirements for expansion and contraction may be allowed pending approval of the Contracting Officer.

N. INSTALLATION CLEARANCES:

1. Supply pipes, valves, and fittings shall be kept a sufficient distance from other work and other services to permit not less than 1/2 inch between finished covering on the different services.
2. Bare and insulated water lines shall not bear directly against building structural elements so as to transmit sound to the structure or to prevent flexible movement of the lines.
3. Water pipe shall not be buried in or under floors unless specifically indicated or approved.
4. Changes in pipe sizes shall be made with reducing fittings.

O. DIRECTION CHANGES:

1. Change in direction shall be made with fittings, except that bending of pipe 4 inches and smaller will be permitted, provided a pipe bender is used and wide sweep bends are formed.
   a. The center-line radius of bends shall be not less than six diameters of the pipe.
   b. Bent pipe showing kinks, wrinkles, flattening, or other malformations will not be acceptable.

P. SOUND STOPPING:

1. Provide sound stopping and operating clearance to prevent structure contact:
   a. Where piping penetrates walls, floors, or ceilings
   b. Where piping penetrates into occupied spaces adjacent to equipment rooms
   c. Where similar penetrations occur between occupied spaces
   d. Where penetrations occur from pipe chases into occupied spaces
2. Construct penetrations with finishes compatible with surface being penetrated.
3. Sound stopping of pipe shafts, and large floor and wall openings may be accomplished by packing with mineral fiber insulation installed and supported in accordance with manufacturer's instructions, or by foaming-in-place with self-extinguishing 2-pound-density polyurethane foam to a depth not less than 6 inches. Finish foam with a rasp.
4. Where fire stopping is a consideration, use only mineral fiber, and, in addition, cover openings with 16-gauge sheet metal., and caulk with fire caulk to meet wall rating.

Q. VIBRATION ISOLATION:

1. Plumbing equipment, including compressors and pumps, shall be isolated from the building structure by specified vibration-absorbing features, unless otherwise shown. See Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment and Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment for details.
2. Piping connected to mechanical equipment shall be provided with flexible connectors.

R. Vertical Piping Support: The use of split clamp and threaded rod to support vertical pipe along walls or columns is prohibited. Support all pipe bases at base of riser. See Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment for details.

S. Water Closets: Carriers for water closets shall be sized specifically for the thickness of the wall in which they are installed. Refer to Architectural drawings for wall details.

3.4 ESCUTCHEONS

A. Install escutcheons on all pipes where they pass through floors, ceilings, walls, or partitions in finished and exposed construction areas.

B. Escutcheons shall be one-piece stamped brass type designed to fit the pipe and to cover the terminating pipe sleeve. Escutcheons shall be chrome plated finish unless otherwise specified with a securing device to hold them tight to the pipe. Split, hinged-type escutcheons are not permitted.

C. Allow sufficient spacing between parallel pipe runs to ensure installation of escutcheons without modification. Do not alter the escutcheons in any manner to allow for installation.

3.5 PAINTING

A. See Architectural drawings and Section 09 91 13 - Exterior Painting for finish paint instructions for all piping and equipment.

B. New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

C. Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117 and ASTM B-287, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark. The film thickness of the factory painting system applied on the equipment must not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system must be designed for the temperature service.

D. Repaint factory painted equipment that has been scratched or marred to match original factory color.

E. Do not paint over nameplates on equipment.

F. **Re-coat galvanizing broken during construction with cold galvanizing compound.**

3.6 SYSTEM STARTUP

A. See individual specifications sections for systems startup instructions for systems and equipment.

3.7 CLEANING

A. System Flushing: Before operational tests or disinfection, flush new water piping systems with hot potable water. Sufficient water shall be used to produce a water velocity that is capable of entraining and removing debris in all portions of the piping system. This requires simultaneous operation of all fixtures on a common branch or main in order to produce a flushing velocity of approximately 4 fps through all portions of the piping system.

1. In the event that this is impossible due to size of system, the Authority Having Jurisdiction (AHJ) shall specify the number of fixtures to be operated during flushing.
2. Provide adequate personnel to monitor the flushing operation and to ensure that drain lines are unobstructed to prevent flooding of the facility. Repair and restore any flood damage resulting from flushing of the system to the satisfaction of the Government.
3. Flushing shall be continued until entrained dirt and other foreign materials have been removed and until discharge water shows no discoloration.
4. All faucets and drinking water fountains, to include any device considered as an end point device by NSF/ANSI 61, Section 9, shall be flushed a minimum of 0.25 gallons per 24 hour period, ten times over a 14 day period.
5. After flushing, system shall be drained at low points, and strainer screens shall be removed, cleaned, and replaced.
6. After flushing and cleaning, systems shall be prepared for testing by immediately filling water piping with clean, fresh potable water.
7. Any stoppage, discoloration, or other damage to the finish, furnishings, or parts of the building due to Contractor failure to properly clean the piping system shall be repaired by Contractor at no additional expense to Government.
8. When the system flushing is complete, the hot-water system shall be adjusted for uniform circulation. Flushing devices and automatic control systems shall be adjusted for proper operation according to manufacturer's instructions.

B. Disinfection: See STERILIZATION section below.

C. Remove all stickers, rust, stains, labels and temporary covers before final acceptance.

D. At the completion of the work, clean all parts of the installation. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system. Adjust automatic control devices for proper operation.

E. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements.

3.8 TESTS

A. Upon completion of flushing and prior to disinfection procedures, Contractor shall subject the plumbing system to operating tests to demonstrate satisfactory installation, connections, adjustments, and functional and operational efficiency. Such operating tests shall cover a period of not less than 8 hours for each system and shall include the following information in a report with conclusion as to the adequacy of the system:

1. Time, date, and duration of test.
2. Water pressures at the most remote and the highest fixtures.
3. Pump suction and discharge pressures.
4. Leaving water temperature of each domestic hot-water supply source.
5. Operation of each vacuum breaker and backflow preventer.

B. Contractor is responsible for approved disposal of contaminated water used for all system tests.

C. Prior to acceptance of the work, test completed systems in the presence of the Authority Having Jurisdiction (AHJ). Upon approval, provide certificates of testing.

D. Conduct a hydrostatic test, unless otherwise specified. Use only potable water for testing.
   1. Test domestic hot- and cold-water piping for a continuous period of not less than four hours at a hydrostatic pressure of not less than 125 psig and make free from leaks. Completely remake leaky joints with piping dry. Retest system after leaks are corrected.
   2. Plug all necessary openings in the drainage and vent piping systems and fill the entire system with water to the level of the highest vent stack above the roof. Hold this water for 30 minutes without showing a drop in water level greater than 4 inches. Final test shall include a smoke test. For plumbing stacks in excess of 30'-0", perform sectional hydrostatic testing or smoke testing.

E. Backflow Prevention Assemblies: Backflow prevention assembly shall be tested using gauges specifically designed for the testing of backflow prevention assemblies.

3.9 STERILIZATION

A. Coordinate with the Authority Having Jurisdiction (AHJ) to determine final sterilization methods required prior to beginning sterilization of domestic water piping systems.

B. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

C. Clean and disinfect potable domestic water piping as follows:
   1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
   2. Use purging and disinfecting procedures prescribed by Authority Having Jurisdiction (AHJ); if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652, or follow procedures described below:
      a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
      b. Fill and isolate system according to either of the following:
         1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
         2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

D. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from Authority Having Jurisdiction (AHJ).

3.10 ADJUSTING

A. Perform the following adjustments before operation:
   1. Close drain valves, hydrants, and hose bibbs.
   2. Open shutoff valves to fully open position.
   3. Open throttling valves to proper setting.
   4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

B. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

C. Remove and clean strainer screens. Close drain valves and replace drain plugs.

D. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.

E. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLOSEOUT ACTIVITIES

A. See Section 01 78 23 - Operation and Maintenance Data, for closeout submittals.

B. See Section 01 77 00 – Closeout Requirements, for additional requirements.

C. Demonstration: Demonstrate operation of system to Government's personnel.

1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, and maintenance of each component.

D. Training: Schedule training for all plumbing equipment at the end of construction.

3.12 MAINTENANCE

A. See Sections 01 77 00 – Closeout Requirements and 01 78 23 - Operation and Maintenance Data, for additional requirements relating to maintenance service.

END OF SECTION 22 00 50

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SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

B. Pipe sleeve-seals.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior piping systems.

C. Section 09 91 23 - Interior Painting: Preparation and painting of interior piping systems.

D. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Piping identification.

E. Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.4 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements for submittal procedures.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

1.7 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data, for additional warranty requirements.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 2 inch above finished floor.
2. Provide sealant for watertight joint.
3. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.

C. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

D. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Contracting Officer.

E. Clearances:

1. Provide allowance for insulated piping.
2. Wall, Floor, Partitions, and Beam Flanges: two pipe sizes greater than external pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.2 PIPE-SLEEVE SEALS

A. Modular Mechanical Sleeve-Seal:

1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
2. Watertight seal between pipe and wall-sleeve, wall or casing opening.
3. Size and select seal component materials in accordance with service requirements.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Structural Considerations: Do not penetrate building structural members unless indicated.

E. Provide sleeves when penetrating footings, floors, walls, and rated assemblies. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
   a. Pack solid using mineral fiber complying with ASTM C592.
   b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

F. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.2 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 22 05 17

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1.1 SECTION 22 05 19 - METERS AND GAUGES FOR PLUMBING PIPING

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Pressure gauges.

B. Thermometers.

C. Pressure-temperature test plugs.

2.2 REFERENCE STANDARDS

A. ASTM E1 - Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014.

B. ASTM E77 - Standard Test Method for Inspection and Verification of Thermometers; 2014 (Reapproved 2021).

C. NSF 61 - Drinking Water System Components - Health Effects; 2024.

D. NSF 372 - Drinking Water System Components - Lead Content; 2024.

2.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures for submittal procedures.

B. Product Data: Provide product data sheets for each furnished item with associated components and accessories.

PART 2 PRODUCTS

3.1 THERMOMETERS

A. General:

1. Product Compliance: ASTM E1.
2. Lens: Clear glass or polycarbonate (indoors, not exposed to direct sunlight only), except where stated.
3. Accuracy: One percent, when tested in accordance with ASTM E77, except where stated.
4. Scale: Black markings depicting single scale in degrees F where expected process value falls half-span of standard temperature range.

B. Thermometers - Adjustable Angle: 7 inch v-shape aluminum case with window scale, 6 inch NPT stem, red or blue organic non-toxic liquid filled glass tube, and adjustable joint with positive locking device allowing 360 degrees in horizontal plane or 180 degrees in vertical plane adjustments.

C. Thermometers - Dial Type:

1. Adjustable Angle: 5 inch diameter liquid-filled dial with black pointer, stainless steel case, silicone damping bimetal element, hermetically sealed shatterproof-lens, recalibrating screw, and 2-1/2 inch NPT stem.

3.2 PRESSURE-TEMPERATURE TEST PLUGS:

A. Size: 500 psi capacity; 1/2 inch MPT brass fitting with gasket, cap, and retaining strap for 1/8 inch pressure gauge or temperature probe.

B. Wetted Materials per Temperature Range:

1. Up to 200 degrees F: Brass probe with neoprene core.

C. Accessories: Brass, lever-handle cock and snubber-filter.

PART 3 EXECUTION

4.1 EXAMINATION

A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports, and test plugs.

4.2 INSTALLATION

A. Install metering products in accordance with manufacturer's instructions for intended fluid type and service.

B. Install thermometers as follows:

1. Water Heaters: Place upstream and downstream of heater. Add one on the inlet end when using steam as the water heating medium.
2. Piping: Install thermometers in branch butt weld connection fitting or socket-weld thermowell. Enlarge pipes smaller than 2-1/2 inch to accommodate sockets. Ensure sockets are above insulation clearance.

C. Locate test plugs adjacent to thermometers and thermometer sockets, adjacent to pressure gauges and pressure gauge taps, adjacent to control device sockets, and where indicated.

4.3 SCHEDULES

A. Pressure Gauges, Location and Scale Range:

1. Pumps, 0 to 200 psi.
2. Pressure reducing valves, 0 to 200 psi.
3. Backflow preventers and Reduced Pressure Zone Assemblies (RPZA) - Street side of service, 0 to 200 psi.

B. Pressure Gauge Tappings, Location:

1. Control valves 3/4 inch & larger - inlets and outlets.

C. Thermometers, Location and Scale Range:

1. Domestic water heaters - supply outlet and recirculation within 5 feet of last fixture served at end of line (or integral to pump), 0 to 240 degrees F.

END OF SECTION 22 05 19

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Ball valves.

B. Check valves.

C. Gate valves.

1.2 RELATED REQUIREMENTS

A. Section 08 31 00 - Access Doors and Panels.

B. Section 22 10 05 - Plumbing Piping.

1.3 ABBREVIATIONS AND ACRONYMS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Non-rising stem.

E. OS&Y: Outside screw and yoke.

F. PTFE: Polytetrafluoroethylene.

G. RS: Rising stem.

H. TFE: Tetrafluoroethylene.

I. WOG: Water, oil, and gas.

1.4 REFERENCE STANDARDS

A. API STD 594 - Check Valves: Flanged, Lug, Wafer, and Butt-Welding; 2022.

B. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

C. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

D. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

E. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

F. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

G. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

H. ASME B31.9 - Building Services Piping; 2020.

I. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

L. ASTM F3226 - Standard Specification for Metallic Press-Connect Fittings for Piping and Tubing Systems; 2019 Edition, August 1st 2019.

M. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

N. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

O. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

P. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

Q. NSF 61 - Drinking Water System Components - Health Effects; 2024.

R. NSF 372 - Drinking Water System Components - Lead Content; 2024.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures for submittal procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.
   a. Provide temporary inlet and outlet caps.
   b. Maintain caps in place until installation.
2. Store valves in shipping containers and maintain in place until installation.
   a. Store valves indoors in dry environment.
   b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

1.7 EXERCISE THE FOLLOWING PRECAUTIONS FOR HANDLING:

A. Avoid the use of operating handles or stems as rigging or lifting points.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. See drawings for specific valve locations.

B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

C. Provide the following valves for the applications if not indicated on drawings:

1. Shutoff: Ball, or gate.
2. Swing Check:
   a. 2 inch and Smaller: Bronze swing check valves with bronze or nonmetallic disc.

D. Substitutions of valves with higher CWP classes or WSP ratings for same valve types are permitted when specified CWP ratings or WSP classes are not available.

E. Required Valve End Connections for Non-Wafer Types:

1. Copper Tube:

a. 2 inch and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
b. 2-1/2 inch to 4 inch: Grooved or flanged ends except where threaded valve-end option is indicated in valve schedules below.

F. Domestic, Hot and Cold Water Valves:

1. 3 inch and Smaller:
   a. Bronze and Brass: Provide with solder-joint, threaded, or press ends.
   b. Ball: One or two piece, full port, brass or bronze with matching brass or bronze, or stainless steel trim.
   c. Bronze Swing Check: Class 125, bronze disc.
2. 4 inch and Larger:
   a. Iron, 4 inch and larger: Provide with flanged ends.
   b. Iron Ball: Class 150.
   c. Iron Swing Check with Closure Control: Class 125, lever and spring.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Handwheel: Valves other than quarter-turn types.
2. Hand Lever: Quarter-turn valves 6 inch and smaller except plug valves.

D. Insulated Piping Valves: With 2 inch stem extensions and the following features:

1. Gate Valves: Rising stem.
2. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

E. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
4. Press-Connect Fittings: ASTM F3226.
5. Solder Joint Connections: ASME B16.18.

F. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Solder-joint Connections: ASME B16.18.
3. Building Services Piping Valves: ASME B31.9.

G. Potable Water Use:

1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.3 BRASS, BALL VALVES

A. One Piece, Full Port with Brass Trim :

1. Comply with MSS SP-110.
2. CWP Rating: 200 psi.
3. Body: Forged brass.
4. Seats: PTFE.
5. Stem: Brass.
6. Ball: Chrome-plated brass.
7. Operator: Handle.

2.4 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Two Piece, Full Port with Bronze or Stainless Steel Trim:

1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. WOG Rating: 600 psi.
4. Body: Forged bronze or dezincified-brass alloy.
5. Seats: PTFE.

2.5 IRON, BALL VALVES

A. Class 125, Full Port, Stainless Steel Trim:

1. Comply with MSS SP-72.
2. CWP Rating: 200 psi.
3. Body: ASTM A536 Grade 65-45-12, ductile iron.
4. End Connections: Flanged.
5. Seats: PTFE.
6. Operator: Lever with locking handle.

2.6 BRASS, INLINE CHECK VALVES

A. Class 150:

B. Maximum Service Temperature: 250 degrees F.

C. Body: Forged brass.

D. Disc: Forged brass.

E. Seal: PTFE, bubble-tight.

2.7 BRONZE, SWING CHECK VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. Class 125:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. WOG Rating: 200 psi.
4. Body: Bronze, ASTM B62.
5. Disc: Bronze.

2.8 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125 with Lever and Spring-Closure Control.

1. Comply with MSS SP-71, Type I.
2. Description:
   a. CWP Rating: 200 psi.
   b. Design: Clear or full waterway.
   c. Body: ASTM A126, gray iron with bolted bonnet.
   d. Trim: Bronze.
   e. Gasket: Asbestos free.
   f. Closer Control: Factory installed, exterior lever, and weight.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

C. Where valve support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welds.

D. Install check valves where necessary to maintain direction of flow as follows:

1. Lift Check: Install with stem plumb and vertical.
2. Swing Check: Install horizontal maintaining hinge pin level.
3. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

END OF SECTION 22 05 23

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SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Prefabricated trapeze-framed systems.

B. Strut systems for pipe or equipment support.

C. Beam clamps.

D. Pipe hangers.

E. Pipe rollers and roller supports.

F. Pipe supports, guides, shields, and saddles.

G. Nonpenetrating rooftop supports for low-slope roofs.

H. Anchors and fasteners.

I. Instructions for Interior and Exterior Hangars and Supports

1.2 RELATED REQUIREMENTS

A. Section 22 00 50 - Common Work Results for Plumbing

B. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

C. Section 09 91 13 - Exterior Painting: Final finishes and painting instructions.

D. Section 09 91 23 - Interior Painting: Final finishes and painting instructions.

E. Section 22 05 48 - Vibration and Seismic Controls for Plumbing Piping and Equipment: - All seismic design and installation requirements.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General-Purpose Piping; 2023.

D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).

F. ASTM A283/A283M - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2018.

G. ASTM A395/A395M - Standard Specification for Ferritic Ductile Iron Pressure-Retaining Castings for Use at Elevated Temperatures; 1999 (Reapproved 2022).

H. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

I. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

J. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

M. FM (AG) - FM Approval Guide; Current Edition.

N. MFMA-4 - Metal Framing Standards Publication; 2004.

O. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

P. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

Q. UL (DIR) - Online Certifications Directory; Current Edition.

R. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide hardware to hang or support piping, equipment, or fixtures with related accessories to complete installation of plumbing work.

B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.

C. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 100%. Include consideration for vibration, equipment operation, and shock loads where applicable.

D. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.

E. Vibration Isolation and Seismic Restraint Requirements: See Section 22 05 48.

F. Materials for Metal Fabricated Supports: Comply with Section 05 50 00.

1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.

G. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

1. Outdoor, Damp, or Wet-Indoor Locations: Use stainless steel unless otherwise indicated.

2.2 PREFABRICATED TRAPEZE-FRAMED SYSTEMS

A. Prefabricated Trapeze-Framed Metal Strut Systems:

1. MFMA-4 compliant, pre-fabricated, MSS SP-58 Type 59 continuous-slot metal strut channel with associated tracks, fittings, and related accessories.
2. Strut Channel or Bracket Material:
   a. Indoor Dry Locations: Use zinc-plated steel or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel with cold-galvanizing compound applied to all cut edges.
3. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

2.3 STRUT SYSTEMS FOR PIPE OR EQUIPMENT SUPPORT

A. Strut Channels:

1. ASTM A653/A653M galvanized steel bracket with clamps for surface mounting of piping or plumbing equipment support.
2. Channel or Bracket Kits: Include rods, brackets, end-fixed fittings, covers, clips, and other related hardware required to complete sectional trapeze section for piping or other support.

B. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Piping up to 1 inch: 1/4 inch diameter.
   c. Piping larger than 1 inch: 3/8 inch diameter.

C. Channel Nuts:

1. Provide carbon steel channel nut with epoxy copper or zinc finish and long, regular, or short spring as indicated by strut channel manufacturer's installation instructions.

2.4 BEAM CLAMPS

A. MSS SP-58 types 19 through 23, 25 or 27 through 30 based on required load.

B. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.

C. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.

2.5 PIPE HANGERS

A. Swivel Ring Hangers, Adjustable:

1. MSS SP-58 type 10, epoxy-painted, zinc-colored.
2. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
3. FM (AG) and UL (DIR) listed for specific pipe size runs and loads.

B. Clevis Hangers, Adjustable:

1. Copper Tube: MSS SP-58 type 1, epoxy-plated copper.
2. Standard-Duty: MSS SP-58 type 1, zinc-colored, epoxy plated.

2.6 PIPE CLAMPS

A. Riser Clamps:

1. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
2. MSS SP-58 type 1 or 8, carbon steel or steel with epoxy plated, plain, stainless steel, or zinc plated finish.
3. Copper Tube Pipe Clamp: MSS SP-58 type 8, epoxy plated copper.
4. UL (DIR) listed: Pipe sizes 1/2 to 8 inch.

B. Strut Clamps:

1. Pipe Clamp: Two-piece rigid, universal, or outer diameter type, carbon steel with epoxy copper or zinc finish.

2.7 PIPE ROLLERS AND ROLLER SUPPORTS

A. MSS SP-58 type 43 based on required load, nonconductive and corrosion resistant.

B. Material: Zinc plated ASTM A36/A36M carbon steel or ASTM A47/A47M malleable iron.

2.8 PIPE SUPPORTS, GUIDES, SHIELDS, AND SADDLES

A. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

B. Stanchions:

1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
3. For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.

C. U-Bolts:

1. MSS SP-58 type 24, carbon steel u-bolt for pipe support or anchoring.

D. Intermediate Anchors and Pipe Alignment Guides:

1. Pipe Sizes 6 inch and Smaller: Minimum clearance of 0.16 inch.
2. Pipe Size 8 inch: 0.625 inch U-bolt with double nuts providing minimum clearance of 0.28 inch.
3. Pipe Size 10 inch: 0.75 inch U-bolt.
4. Pipe Sizes 12 to 16 inch: 0.875 inch U-bolt.
5. Pipe Sizes 18 to 30 inches: 1 inch U-bolt.
6. Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.

E. Pipe Alignment Guides:

1. Pipe Sizes 8 inch and Smaller: Spider or sleeve type.
2. Pipe Sizes 10 inch and Larger: Roller type.

F. Pipe Shields for Insulated Piping:

1. MSS SP-58 type 40, ASTM A1011/A1011M steel or ASTM A653/A653M carbon steel.
2. General Construction and Requirements:
3. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.

G. Pipe Supports:

1. Material: ASTM A395/A395M ductile iron, ASTM A36/A36M carbon steel, ASTM A47/A47M malleable iron, ASTM A181/A181M forged steel, or ASTM A283/A283M steel.
2. Liquid Temperatures Up to 122 degrees F:
   a. Overhead Support: MSS SP-58 types 1, 3 through 12 clamps.
   b. Support From Below: MSS SP-58 types 35 through 38.
3. Operating Temperatures from 122 to 446 degrees F:
   a. Overhead Support: MSS SP-58 type 1 or 3 through 12 clamps with appropriate saddle of MSS SP-58 type 40 for insulated pipe.
   b. Roller Chair: MSS SP-58 types 41 or 43 through 46 roller chair support with appropriate saddle of MSS SP-58 type 39 for insulated pipe.

c. Sliding Support: MSS SP-58 types 35 through 38.

H. Pipe Supports, Thermal Insulated:

1. General Requirements:
   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
   b. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
   c. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
   d. Provide pipe supports for 1/2 to 30 inch iron pipes.
   e. Insulation inserts to consist of rigid phenolic foam, rigid polyisocyanurate, or calcium silicate insulation surrounded by PVC jacketing.
2. PVC Jacket:
   a. Pipe insulation protection shields to be provided with ball bearing hinge and locking seam.
   b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
   c. Minimum Thickness: 60 mil, 0.06 inch.

2.9 NONPENETRATING ROOFTOP SUPPORTS FOR LOW-SLOPE ROOFS

A. Provide steel pedestals with UV-resistant thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.

B. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.

C. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.

D. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

2.10 ANCHORS AND FASTENERS

A. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.

B. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.

C. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.

D. Hollow Masonry: Use toggle bolts.

E. Hollow Stud Walls: Use toggle bolts.

F. Steel: Use beam ceiling clamps, beam clamps, machine bolts, or welded threaded studs.

G. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.

H. Sheet Metal: Use sheet metal screws.

I. Wood: Use wood screws.

J. Plastic and lead anchors are not permitted.

K. Powder-actuated fasteners are not permitted.

L. Hammer-driven anchors and fasteners are not permitted.

M. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

N. Preset Concrete Inserts: Continuous metal strut channel and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.

1. Channel Material: Use galvanized steel.
2. Manufacturer: Same as manufacturer of metal strut channel framing system.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use, where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Contracting Officer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Contracting Officer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Insulated Piping:

1. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
2. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
3. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.
4. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
5. Piping saddles for insulated piping with vapor barrier.
   a. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

b. Insulation Without Vapor Barrier: Install MSS SP-58, Type 39 protection saddles. Fill interior voids with insulation that matches adjoining insulation.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized 4 inch high concrete pad constructed in accordance with Section 03 30 00.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
6. Install lateral bracing with pipe hangers and supports to prevent swaying.
7. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
8. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

L. Remove temporary supports.

3.3 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Smooth all exposed sharp edges created by cuts or trimming. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint or cold-galvanizing compound to comply with ASTM A780/A780M.

C. See Section 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting for additional instructions.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 22 05 29

SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. External seismic snubber assemblies.

F. Seismic restraint systems.

1.2 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.

1.3 DEFINITIONS

A. Plumbing Component: Where referenced in this section in regards to seismic controls, applies to any portion of the plumbing system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., piping).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. FEMA 412 - Installing Seismic Restraints for Mechanical Equipment; 2014.

D. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

E. FEMA 414 - Installing Seismic Restraints for Duct and Pipe; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. MFMA-4 - Metal Framing Standards Publication; 2004.

I. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures for submittal procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
2. Seismic Controls: Include seismic load capacities.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

B. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

1. Designer may be employed by the manufacturer of the seismic restraint products.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing plumbing equipment and/or plumbing connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.

D. Equipment Isolation: As indicated on drawings.

E. Piping Isolation:

1. Provide vibration isolators for piping supports:
   a. Located in equipment rooms.
   b. Located within 50 feet of connected vibration-isolated equipment and pressure-regulating valve (PRV) stations.
   c. For piping over 2 inch located below or within 50 feet of noise-sensitive areas indicated.
2. Minimum Static Deflection:

a. First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
b. Remainder of Supports: 0.75 inch deflection unless otherwise indicated.

3. Suspended Piping, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
4. Suspended Piping, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
5. Floor-Mounted Piping, Nonseismic Applications: Use open (unhoused) spring isolators.
6. Floor-Mounted Piping, Seismic Applications: Use seismic type restrained spring isolators.
7. Use modular seal or approved resilient material where vibration-isolated piping penetrates building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.2 SEISMIC CONTROL REQUIREMENTS

A. Design and provide plumbing component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor plumbing components.

B. Seismic Design Criteria: Obtain from project Structural Engineer of Record.

C. Component Importance Factor (Ip): Plumbing components essential to life safety to be assigned a component importance factor (Ip) of 1.5 as indicated or as required. This includes but is not limited to:

1. Plumbing components required to function for life safety purposes after an earthquake.
2. **Plumbing components that support or otherwise contain hazardous substances, e.g., Chemical Waste piping**.

D. Premanufactured Modular Plumbing Equipment: Where not otherwise seismically qualified, premanufactured modules 6 feet high and taller furnished under other sections to be designed in accordance with seismic provisions for nonbuilding structures.

E. Seismic Restraints:

1. Provide seismic restraints for plumbing components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions:
   a. Exemptions for Seismic Design Category C:
      1) Plumbing components where either of the following apply:
         (a) The component importance factor (Ip) is 1.0 and the component is positively attached to the structure.
         (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.

2) Plumbing piping with component importance factor (Ip) of 1.5 and nominal pipe size of 2 inch or less, where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, and where piping is positively attached to the structure; exemption does not apply to piping constructed of low-deformability materials (e.g., cast iron, glass, nonductile plastics).

b. Plumbing Piping Exemptions, All Seismic Design Categories:

1) Plumbing piping where flexible connections, expansion loops, or other assemblies are provided between piping and associated components, where piping is positively attached to the structure, and where one of the following apply:

(a) Trapeze supported piping weighing less than 10 pounds per foot, where all pipes supported meet size requirements for exemption as single pipes described under specific seismic design category exemptions above.

(b) Trapeze supported piping with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

(c) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 200 pounds or less.

(d) Trapeze supported piping with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in length from support point connection to the supporting structure, where all pipes supported have a component importance factor (Ip) of 1.0 and meet size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single trapeze is 100 pounds or less.

(e) Hanger supported piping with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, where pipe has a component importance factor (Ip) of 1.0 and meets size requirements for exemption as single pipes described under specific seismic design category exemptions above, and where the total weight supported by any single rod is 50 pounds or less.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:

a. FEMA 412.

b. FEMA 413.
c. FEMA 414.
d. FEMA E-74.
e. SMACNA (SRM).

4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:
   a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
   b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
7. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated plumbing components, including distributed systems.
   c. Use only one restraint system type for a given plumbing component or distributed system (e.g., piping) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain plumbing component in all lateral directions; consider bracket geometry in anchor load calculations.
   e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported plumbing component weight.
   f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported plumbing component weight.
   g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
   h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
   i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:

1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.

2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:

1. Include provisions to prevent seismic impact between plumbing components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.

H. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections to accommodate:
   a. Relative displacements at connections between components, including distributed systems (e.g., piping); do not exceed load limits for equipment utility connections.
   b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
   c. Design displacements at seismic separations.
   d. Anticipated drifts between floors.

2.3 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Concrete Inertia Bases:

1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 30 00.
6. Pump Applications: Size and configure bases for piping elbow supports as required.

2.4 VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
   a. Color code or otherwise identify springs to indicate load capacity.
   b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
   c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
   d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
   e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
   f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
   a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
   b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Nonseismic Applications:

1. Resilient Material Isolator Pads:
   a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
   b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
   c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.
2. Resilient Material Isolator Mounts, Nonseismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.

d. Furnished with integral leveling device for positioning and securing supported equipment.

5. Restrained Spring Isolators, Nonseismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
   b. Bottom Load Plate: Steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Nonseismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
   b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

C. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.
2. Restrained Spring Isolators, Seismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
   b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
3. Resilient Material Isolator Hangers, Seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
4. Spring Isolator Hangers, Seismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

5. Combination Resilient Material/Spring Isolator Hangers, Seismic:
a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.5 ACOUSTICAL AND VIBRATION ISOLATORS

A. General Requirements:

1. Acoustical Isolation System: Through-stud isolators, pipe clamps, riser clamp pads, neoprene and felt lining material and associated support brackets.

2.6 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:

1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.7 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Government or Contracting Officer in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.

1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:

1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with the certificate of compliance.
2. Installation and anchorage of piping systems designed to carry hazardous materials and their associated mechanical units for Seismic Design Categories C, D, E, and F; periodic inspection.
3. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where the approved Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
4. Verification of required clearances between plumbing equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Government acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Secure fasteners according to manufacturer's recommended torque settings.

D. Install flexible piping connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

E. Vibration Isolation Systems:

1. Vibration-Isolated Equipment Support Bases:
    a. Provide specified minimum clearance beneath base.
2. Spring Isolators:
    a. Position equipment at operating height; provide temporary blocking as required.
    b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
    c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
3. Isolator Hangers:
    a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
    b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

F. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris, or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
    a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
    b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
    c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
    a. Size in accordance with seismic design to meet anchor requirements.
    b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.

6. Seismic Restraint Systems:
    a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
    b. Install restraints within permissible angles in accordance with seismic design.
    c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
    d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
    e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Provide manufacturer representative or authorized technician services to assist with inspection and testing of vibration isolation systems and seismic controls. Submit a detailed copy of manufacturer recommended inspection, testing, and field report procedures.

D. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

E. Seismic Controls:

1. Verify snubbing element air gaps.

F. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.5 ATTACHMENTS

A. Statement of special inspections.

END OF SECTION 22 05 48

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Pipe markers.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

PART 2 PRODUCTS

2.1 PLUMBING COMPONENT IDENTIFICATION GUIDELINE

A. Nameplates:

1. Heat exchangers, water heaters, and other heat transfer products.
2. Control panels, transducers, and other related control equipment products.
3. Pumps, tanks, filters, water treatment devices, and other plumbing equipment products.

B. Tags:

1. Piping: 3/4 inch diameter and smaller.
2. Manual operated and automated control valves.
3. Ceiling tacks placed on lay-in ceiling surface to reference plumbing components.

C. Pipe Markers: 3/4 inch diameter and higher.

2.2 NAMEPLATES

A. Description: Laminated piece with up to three lines of text.

1. Letter Color: White.
2. Letter Height: 1/4 inch.
3. Background Color: Black.

2.3 TAGS

A. Flexible: Vinyl with engraved black letters on light contrasting background color with up to three lines of text. Minimum tag size 1-1/2 inch in diameter.

B. Metal: brass or stainless steel, 19 gauge 1-1/2 inch in diameter with smooth edges, blank, smooth edges, and corrosion-resistant ball chain. Up to three lines of text.

C. Valve Tag Chart: Typewritten 12-point letter size list in anodized aluminum frame.

D. Piping: 3/4 inch diameter and smaller. Include corrosion resistant chain. Identify service, flow direction, and pressure.

2.4 PIPE MARKERS

A. Comply with ASME A13.1.

B. Flexible Marker: Factory fabricated, semi-rigid, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid conveyed.

C. Flexible Tape Marker: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Identification Scheme, ASME A13.1:

1. Primary: Nominal Pipe Diameter
   a. 3/4 to 1-1/4 inches: Use 8 inch field-length with 1/2 inch text height.
   b. 1-1/2 to 2 inches: Use 8 inch field-length with 3/4 inch text height.
   c. 2-1/2 to 6 inches: Use 12 inch field-length with 1-1/4 inch text height.
   d. 8 to 10 inches: Use 24 inch field-length with 2-1/2 inch text height.
   e. Over 10 inches: Use 32 inch field-length with 3-1/2 inch text height.
2. Secondary: Color scheme per fluid service.
   a. Combustible Fluids: White text on brown background.
   b. Compressed Air: White text on blue background.
   c. Fire Quenching Fluids: White text on red background.
   d. Flammable and Oxidizing Fluids: Black text on yellow background.
   e. Toxic and Corrosive Fluids: Black text on orange background.
   f. Water; Potable, Cooling, Boiler/Chilled Water Makeup Water Feed, and Other: White text on green background.
3. Tertiary: Other Details.
   a. Directional flow arrow.
   b. Line pressure (compressed air / gas only).
   c. Line temperature (domestic hot water only).

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive identification products.

3.2 INSTALLATION

A. Install flexible nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags in clear view and align with axis of piping

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe marker around pipe in accordance with manufacturer's instructions.

E. Apply ASME A13.1 Pipe Marking Rules:

1. Place pipe marker adjacent to changes in direction.

2. Place pipe marker adjacent each valve port and flange end.
3. Place pipe marker at both sides of floor and wall penetrations.
4. Place pipe marker every 25 to 50 feet interval of straight run.

F. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 22 05 53

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SECTION 22 07 19 - PLUMBING PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Flexible elastomeric cellular insulation.

B. Glass fiber insulation.

C. Polyethylene insulation.

D. Jacketing and accessories.

E. Insulation Schedules for:

1. Domestic Hot Water Supply
2. Domestic Hot Water Recirculation
3. Domestic Cold Water
4. Roof Drain Bodies
5. Roof Drainage Run Horizontal
6. Condensate Drain Piping
7. Field-Applied Jacketing

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 22 05 53 - Identification for Plumbing Piping and Equipment: Labeling formatting, colors, and additional instructions for insulation and field-applied jacketing.

C. Section 22 10 05 - Plumbing Piping: Placement of hangers and hanger inserts .

1.3 REFERENCE STANDARDS

A. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

B. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement; 2007 (Reapproved 2024).

C. ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement; 2007 (Reapproved 2024).

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

E. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation; 2022a.

F. ASTM C755 - Standard Guide for Selection of Water Vapor Retarders for Thermal Insulation; 2025.

G. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

H. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

J. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

K. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

L. MIL-A-3316 - Adhesives, Fire-Resistant, Thermal Insulation; 1987c (Amended 1990).

M. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C795.

2.2 GLASS FIBER INSULATION

A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.

1. K Value: ASTM C177, 0.24 at 75 degrees F.
2. Maximum Service Temperature: 850 degrees F.
3. Maximum Moisture Absorption: 0.2 percent by volume.

B. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm inch.

C. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.

D. Vapor Barrier Lap Adhesive: Compatible with insulation, and complying with MIL-A-3316C.

E. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.

F. Indoor Vapor Barrier Finish:

1. Vinyl emulsion type acrylic, compatible with insulation, black color. Suitable for indoor use on below-ambient services.
   a. Water-Vapor Permeance: Comply with ASTM C755, Section 7.2.2, Table 2 for insulation type and service conditions.
   b. Service temperature range: -20°F to 180°F .

G. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation.

H. Insulating Cement: ASTM C449.

2.3 POLYETHYLENE INSULATION

A. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.

1. K Value: ASTM C177; 0.25 at 75 degrees F.
2. Maximum Service Temperature: 200 degrees F.
3. Density: 2 pcf.
4. Maximum Moisture Absorption: 1.0 percent by volume.
5. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
6. Connection: Contact adhesive.

2.4 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 220 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

B. Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

2.5 JACKETING AND ACCESSORIES

PART 3 EXECUTION

3.1 EXAMINATION

A. **IMPORTANT! Verify that piping system has been tested before applying insulation materials.**

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions. 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 in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.

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 multiple layers of insulation with longitudinal and end seams staggered.

E. Exposed Piping: Locate insulation and cover seams in least visible locations.

F. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.

G. Insulation Methods for Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. **For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.**
9. **Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.**

H. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

I. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

J. Flexible Elastomeric Insulated pipes:

1. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

K. Inserts and Shields:

1. Application: Piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert Location: Between support shield and piping and under the finish jacket.
4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.

L. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.

M. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

N. Penetrations:

1. Install insulation continuously through floor and wall penetrations, including fire-rated walls and partitions.
2. Install insulation continuously through exterior wall and roof penetrations. Seal penetrations with flashing sealant.
3. For applications requiring only indoor insulation, terminate insulation on exterior of wall or roof surface and seal with joint sealant.

O. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film. Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

P. Field-Applied Jacketing:

3.3 FINISHES

A. Paint jacket with primer compatible with jacket material, and finish with minimum two finish coats. Add fungicidal agent to render insulation and jacketing materials mildew-resistant. See Section 09 91 13 - Exterior Painting and 09 91 23 - Interior Painting for additional instructions.

B. Label piping with system information as indicated in Section 22 05 53 - Identification for Plumbing Piping and Equipment.

3.4 SCHEDULES

A. Plumbing System Insulation:

1. Domestic Hot Water Supply:

a. Glass Fiber Insulation: All locations, except exterior or high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

b. Polyethylene Insulation: All locations, including exterior and high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

2. Domestic Hot Water Recirculation:

a. Glass Fiber Insulation: All locations, except exterior or high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

b. Polyethylene Insulation: All locations, including exterior and high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

3. Domestic Cold Water:

a. Glass Fiber Insulation: All locations, except exterior or high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

b. Polyethylene Insulation: All locations, including exterior and high humidity locations.

Pipe Size Range	**Insulation Depth**
Up to 1" Dia.	1" Thickness
1-1/4" to 3-1/2" Dia.	1-1/2" Thickness
4" Dia. and above	2" Thickness

4. Storm Water:
    a. Roof Drain Bodies:
        1) Flexible Elastomeric Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
    b. Roof Drainage Run Horizontal:
        1) Flexible Elastomeric Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
    c. Roof Drain Stacks, 20 ft. Height Or Greater:
        1) Flexible Elastomeric Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
        2) Glass Fiber Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
5. Sanitary Drain:
    a. Non-Plastic Plumbing Vents Within 10 Feet of the Exterior:
        1) Flexible Elastomeric Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
    b. Sanitary Drain Stacks, 20 ft. Height Or Greater:
        1) Flexible Elastomeric Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
        2) Glass Fiber Insulation:
            (a) Pipe Size Range: All sizes.
            (b) Thickness: 1 inch.
6. Condensate Drain Piping:
    a. Glass Fiber Insulation:
        1) Pipe Size Range: All sizes.
        2) Thickness: 1 inch.
    b. Flexible Elastomeric Insulation:
        1) Pipe Size Range: All sizes.
        2) Thickness: 1 inch.

B. Field-Applied Jacketing

END OF SECTION 22 07 19

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SECTION 22 10 05 - PLUMBING PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Sanitary waste piping, above grade.

B. Domestic water piping, above grade.

C. Storm drainage piping, buried within 5 feet of building.

1. Storm drainage piping, above grade.
2. Pipe flanges, unions, and couplings.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 91 13 - Exterior Painting.

D. Section 09 91 23 - Interior Painting.

E. Section 22 05 53 - Identification for Plumbing Piping and Equipment.

F. Section 22 07 19 - Plumbing Piping Insulation.

1.3 REFERENCE STANDARDS

A. ANSI Z21.22 - American National Standard for Relief Valves for Hot Water Supply Systems; 2015 (Reaffirmed 2020).

B. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

C. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

D. ASME B16.23 - Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.

E. ASME B16.29 - Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2022.

F. ASME B31.9 - Building Services Piping; 2020.

G. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.

H. ASTM B32 - Standard Specification for Solder Metal; 2008 (Reapproved 2014).

I. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2020.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

L. ASTM B306 - Standard Specification for Copper Drainage Tube (DWV); 2020.

M. ASTM B813 - Standard Specification for Water Flushable Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2024.

N. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2023.

O. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.

P. ASTM C1277 - Standard Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings; 2020.

Q. ASTM D2564 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems; 2020 (Reapproved 2024).

R. ASTM D2665 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Drain, Waste, and Vent Pipe and Fittings; 2024.

S. ASTM D2855 - Standard Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets; 2020 (Reapproved 2024).

T. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2021.

V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications; 2020.

W. NSF 61 - Drinking Water System Components - Health Effects; 2024.

X. NSF 372 - Drinking Water System Components - Lead Content; 2024.

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.

1.5 QUALITY ASSURANCE

A. Perform work in accordance with applicable codes.

B. Valves: Manufacturer’s name and pressure rating marked on valve body.

C. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.2 SANITARY WASTE PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
2. Joints: ASTM B32, alloy Sn50 solder.

D. Copper Pipe: ASTM B42.

1. Fittings: ASME B16.23, cast copper, or ASME B16.29, wrought copper.
2. Joints: ASTM B32, alloy Sn50 solder.

E. PVC Pipe: ASTM D2665. (PROHIBITED IN FACILITIES WITH RETURN AIR PLENUMS)

1. Fittings: PVC.
2. Joints: Solvent welded, with ASTM D2564 solvent cement.

2.3 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type L (B), Drawn (H).

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Joints: ASTM B32, alloy Sn95 solder.
3. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

2.4 PIPE FLANGES, UNIONS, AND COUPLINGS

A. Unions for Pipe Sizes 3 inch and Under:

1. Ferrous Pipe: Class 150 malleable iron threaded unions.
2. Copper Tube and Pipe: Class 150 bronze unions with soldered joints.

B. No-Hub Couplings:

1. Testing: In accordance with ASTM C1277 and CISPI 310.
2. Gasket Material: Neoprene complying with ASTM C564.
3. Band Material: Stainless steel.

4. Eyelet Material: Stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside, before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.

C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

D. Install piping to maintain headroom, conserve space, and not interfere with use of space.

E. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

F. Provide access where valves and fittings are not exposed.

1. Coordinate size and location of access doors with Section 08 31 00.

G. Establish elevations of buried piping outside the building to ensure sufficient cover as to place piping not less than 12 inches below frost line.

H. Install vent piping penetrating roofed areas to maintain integrity of roof assembly.

I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.

J. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.

1. See Section 09 91 23 for painting of interior plumbing systems and components.
2. See Section 09 91 13 for painting of exterior plumbing systems and components.

K. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

L. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.

M. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9 and Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.

5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.

3.4 APPLICATION

A. Install unions downstream of valves and at equipment or apparatus connections.

B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.

3.5 TOLERANCES

A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum slope specified by the applicable codes and jurisdictional requirements for the pipe size and service type (e.g., sanitary, grease waste, acid waste, condensate drain, etc.)

B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

3.6 FIELD TESTS AND INSPECTIONS

A. Verify and inspect systems according to requirements by the Authority Having Jurisdiction (AHJ). In the absence of specific test and inspection procedures proceed as indicated below.

B. Domestic Water Systems:

1. Perform hydrostatic testing for leakage prior to system disinfection.
2. Test Preparation: Close each fixture valve or disconnect and cap each connected fixture.
3. General:
    a. Fill the system with water and raise static head to 10 psi above service pressure. Minimum static head of 50 to 150 psi. As an exception, certain codes allow a maximum static pressure of 80 psi.
4. Metal Piping Systems Subject to Freezing Conditions:
    a. Inject 40 psi of compressed air into piping to spot check for leaks with liquid soap. Document and repair leaks as necessary.
    b. Raise injected compressed air pressure to 1.5 times rated service pressure or minimum pressure of 100 psi for a duration of 2 hours and verify with a gauge that no perceptible pressure drop is measured.

C. Test Results: Document and certify successful results, otherwise repair, document, and retest.

3.7 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Disinfect water distribution system in accordance with Section 22 00 50 - Common Work Results for Plumbing.

B. Prior to starting work, verify system is complete, flushed, and clean.

3.8 SCHEDULES

A. Pipe Hanger Spacing:

1. Metal Piping:
    a. Pipe Size: 1/2 inch to 1-1/4 inch:
        1) Maximum Hanger Spacing: 6.5 ft.
        2) Hanger Rod Diameter: 3/8 inches.

b. Pipe Size: 1-1/2 inch to 2 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 3/8 inch.
c. Pipe Size: 2-1/2 inch to 3 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 1/2 inch.
d. Pipe Size: 4 inch to 6 inch:
   1) Maximum Hanger Spacing: 10 ft.
   2) Hanger Rod Diameter: 5/8 inch.
e. Pipe Size: 8 inch to 12 inch:
   1) Maximum hanger spacing: 14 ft.
   2) Hanger Rod Diameter: 7/8 inch.

2. Plastic Piping:
   a. All Sizes:
      1) Maximum Hanger Spacing: 6 ft.
      2) Hanger Rod Diameter: 3/8 inch.

END OF SECTION 22 10 05

SECTION 22 10 06 - PLUMBING PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Drains.

B. Cleanouts.

C. Hose bibbs.

D. Hydrants.

E. Washing machine outlet boxes.

F. Ice maker outlet boxes.

G. Water hammer arrestors.

H. Mixing valves.

I. Relief valves.

J. Floor drain trap seals.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Product requirements for Government furnished kitchen equipment.

B. Section 22 10 05 - Plumbing Piping.

C. Section 22 30 00 - Plumbing Equipment.

1.3 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.6.4 - Roof, Deck, and Balcony Drains; 2022.

C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers; 2023.

D. ASSE 1012 - Performance Requirements for Backflow Preventers with an Intermediate Atmospheric Vent; 2021.

E. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Prevention Assemblies; 2021.

F. ASSE 1016 - Performance Requirements for Automatic Compensating Valves for Individual Showers and Tub/Shower Combinations; 2017 (Reaffirmed 2021).

G. ASSE 1017 - Performance Requirements for Temperature Actuated Mixing Valves for Hot Water Distribution Systems; 2023.

H. ASSE 1019 - Performance Requirements for Wall Hydrant with Backflow Protection and Freeze Resistance; 2023.

I. NSF 61 - Drinking Water System Components - Health Effects; 2024.

J. NSF 372 - Drinking Water System Components - Lead Content; 2024.

K. PDI-WH 201 - Water Hammer Arresters; 2017.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept specialties on site in original factory packaging. Inspect for damage.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

2.2 DRAINS

A. Roof Drains:

1. Assembly: ASME A112.6.4.
2. Body: Lacquered cast iron with sump.
3. Strainer: Removable polyethylene dome with vandal proof screws.
4. Accessories: Coordinate with roofing type.
   a. Membrane flange and membrane clamp with integral gravel stop.
   b. Adjustable under deck clamp.
   c. Roof sump receiver.
   d. Waterproofing flange.
   e. Controlled flow weir.
   f. Leveling frame.
   g. O-ring seal between male and female connection pipes.

B. Roof Overflow Drains:

1. Lacquered cast iron body and clamp collar and bottom clamp ring; pipe extended to 2 inches above flood elevation.

C. Downspout Nozzles:

1. Bronze round with straight bottom section.

D. Floor Drains:

2.3 CLEANOUTS

2.4 HOSE BIBBS

A. Interior Hose Bibbs:

1. Bronze or brass with mounting flange, replaceable seat, hose thread spout, and integral or add-on vacuum breaker complying with ASSE 1011.

B. Interior Mixing Type Hose Bibbs:

1. Bronze or brass, hot- and cold- water wall-faucet with mounting flange, replaceable seats, hose thread spout, integral checks, handwheels, and vacuum breaker complying with ASSE 1011.

2.5 HYDRANTS

A. Wall Hydrants:

1. ASSE 1019, freeze resistant, self-draining, hose thread spout, and integral vacuum breaker.

2.6 WASHING MACHINE OUTLET BOXES

A. Description: Plastic preformed rough-in box with brass quarter-turn ball valves or single lever-handle valves, socket for 2 inch waste, and slip-in finishing cover.

2.7 ICE MAKER OUTLET BOXES

A. Description: Plastic preformed square or round rough-in box with brass quarter-turn ball valve, and slip-in finishing cover.

2.8 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors:

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

2.9 MIXING VALVES

A. Thermostatic Master Mixing Valves:

1. Valve: ASSE 1017, bronze or brass body; thermostatic element; corrosion- and lime-resistant internal components; integral locking temperature adjustment.
2. Accessories:
   a. Strainer stop checks on inlets.
   b. Shut-off valve on outlet.
3. Cabinet: 16-gauge, 0.0598 inch prime-coated steel, for recessed mounting with keyed lock.

B. Automatic Compensating Valves for Individual Showers and Tub and Shower Combinations:

1. Valve: ASSE 1016, combination thermostatic and pressure balancing, bronze or brass body with inlet checkstops; integral volume and temperature control with adjustable high-temperature limit stop.

2.10 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

2.11 FLOOR DRAIN TRAP SEALS

A. Description: Mechanical trap Push-fit EPDM or silicone fitting with a one-way membrane.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.

C. Encase exterior cleanouts in concrete flush with grade.

D. Install floor cleanouts at elevation to accommodate finished floor.

E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

F. Pipe relief from backflow preventer to nearest drain.

G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, janitor sinks, ice machines, washing machines, and break room sinks or any other quick-closing valve.

H. Protect each trap not serving a water closet or urinal with a trap primer unless specifically noted to be protected with a trap seal instead of a trap primer on the drawings. Where a trap seal is specified for a fixture on the drawings, and is not noted to be installed in lieu of a trap primer, provide both a trap seal and a trap primer for that fixture.

END OF SECTION 22 10 06

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Floor drains.

B. Cleanouts.

1.2 RELATED REQUIREMENTS

A. Section 22 10 05 - Plumbing Piping.

1.3 REFERENCE STANDARDS

A. ASME A112.6.3 - Floor Drains; 2022.

B. ASME A112.36.2 - Cleanouts; 2022.

C. NSF 14 - Plastics Piping System Components and Related Materials; 2023.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's literature and data sheets for each product. Include information on fabrication materials, assembly of components, dimensions, ratings, finishes, rough-in requirements, and installed accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

C. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

D. Store products under cover and protected from weather and dirt. Elevate above grade.

E. Store plastic products protected from direct sunlight.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Plastic Sanitary Waste Piping Specialties: Provide plastic products that comply with NSF 14.

B. Source Limitations: Furnish drains and sanitary waste piping specialties of same kind by same manufacturer.

2.2 FLOOR DRAINS

A. Cast Iron Floor Drains:

1. Assembly: ASME A112.6.3.
2. Body: Lacquered cast iron with anchor flange and membrane clamping collar with weepholes.
3. Strainer: Adjustable, removable, with vandal-proof screws.

a. Square:
1) Material: Stainless steel.
2) Size: 6 by 6 inches.

2.3 CLEANOUTS

A. Wall Cleanouts:

1. Assembly: ASME A112.36.2.
2. Body: Tee type; body material to match surrounding pipe.
3. Plug: PVC or ABS, threaded, gastight.
4. Access Cover: Round, stainless steel wall access cover with vandal-proof screw.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Maintain continuity of waterproofing membranes. Secure waterproofing membranes to drain clamping collars and bonding flanges.

C. Install drains so strainers and grates are level and are at design elevation.

D. Extend cleanouts to finished floor or wall surface. Ensure clearance at cleanout for rodding or jetting of drainage system.

E. Locate, provide, and install cleanouts in piping in accordance with adopted code.

3.2 CLEANING

A. Clean debris from drains.

B. Clean grates and strainers.

3.3 PROTECTION

A. Protect installed drains from accumulating dirt and debris through remainder of construction.

B. Protect installed products from damage due to subsequent construction operations.

END OF SECTION 22 13 19

SECTION 22 30 00 - PLUMBING EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diaphragm-type compression tanks.

B. In-line circulator pumps.

1.2 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

B. ICC (IPC) - International Plumbing Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 174 - Standard for Household Electric Storage Tank Water Heaters; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data:

1. Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
2. Indicate pump type, capacity, power requirements.
3. Provide electrical characteristics and connection requirements.

C. Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

D. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Government's name and registered with manufacturer.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Certifications:

1. Water Heaters: NSF approved.
2. Electric Water Heaters: UL listed and labeled to UL 174.
3. Water Tanks: ASME labeled to ASME BPVC-VIII-1.
4. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

C. Identification: Provide pumps with manufacturer's name, model number, and rating/capacity identified by permanently attached label.

D. Performance: Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.7 WARRANTY

A. See Section 01 78 23 – Operation and Maintenance Data for additional warranty requirements.

B. Provide three year manufacturer warranty for domestic water heaters.

PART 2 PRODUCTS

2.1 COMMERCIAL ELECTRIC WATER HEATERS

A. Factory assembled and wired, electric, vertical storage.

B. Minimum efficiency required: ASHRAE std 90.1.

C. Performance as indicated on the drawings.

D. Accessories: Brass water connections, Brass dip tube, drain valve, magnesium anode. Temperature and pressure relief valve, ASME labeled.

E. Heating elements: Immersion type.

2.2 DIAPHRAGM-TYPE EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psig, with flexible EPDM diaphragm sealed into tank, and steel legs or saddles.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to 12 psig.

2.3 ELECTRICAL WORK

A. Provide electrical motor driven equipment specified complete with motors, motor starters, controls, and wiring.

B. Electrical characteristics to be as specified or indicated on drawings.

C. Furnish motor starters complete with thermal overload protection and other appurtenances necessary for the motor control specified.

D. Supply manual or automatic control and protective or signal devices required for the operation specified, and any control wiring required for controls and devices not shown.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install plumbing equipment in accordance with manufacturer's instructions, as required by code, and complying with conditions of certification, if any.

B. Install all water tanks larger than 5 gallons with a minimum 6" high poured concrete housekeeping pad, or a minimum 6" high floor-mounted manufactured water tank support rail listed and rated to support the served equipment weight and application.

C. All water tanks larger than 5 gallons must be secured to structure with retention straps that have been listed and rated for the application.

D. Coordinate with plumbing piping and related electrical work to achieve operating system.

E. Domestic Water Storage Tanks:

1. Provide steel pipe support, independent of building structural framing members.
2. Clean and flush prior to delivery to site. Seal until pipe connections are made.

END OF SECTION 22 30 00

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SECTION 22 40 00 - PLUMBING FIXTURES

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

A. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.2 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures; 2011 (Reaffirmed 2022).

C. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices; 2020.

D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.

E. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

F. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping; 2021.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

H. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

I. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2017.

J. NSF 61 - Drinking Water System Components - Health Effects; 2024.

K. NSF 372 - Drinking Water System Components - Lead Content; 2024.

L. UL (DIR) - Online Certifications Directory; Current Edition.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept fixtures on site in factory packaging. Inspect for damage.

B. Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

C. All product requirements listed shall be considered minimum performance standards, and shall be adhered to unless specified or scheduled otherwise on drawings. Where the requirements of the Drawings deviate from these specifications, the more stringent requirement of the two shall be maintained.

2.2 REGULATORY REQUIREMENTS

A. Comply with applicable codes for installation of plumbing systems.

B. Comply with UL (DIR) requirements.

C. Perform work in accordance with local health department regulations.

D. All manufacturer products must be commercial-rated. Residential-grade fixtures are disallowed.

2.3 UNDER-LAVATORY PIPE SUPPLY COVERS

A. General:

1. Insulate exposed drainage piping including hot, cold and tempered water supplies under lavatories or sinks per ADA Standards.
2. Adhesives, sewing threads and two ply laminated materials are prohibited.
3. Exterior Surfaces: Smooth nonabsorbent with no finger recessed indentations for easy cleaning.
4. Construction: 1/8 inch PVC with antimicrobial, antifungal and UV resistant properties.
   a. Comply with ASTM E84 for flame and smoke development.
   b. Comply with ASTM C1822 Type III for covers on accessible lavatory piping.
   c. Comply with ASME A112.18.9 for covers on accessible lavatory piping.
   d. Comply with ICC A117.1.
   e. Thermal Resistance: R value of 0.504 or lower when tested by ASTM C177.
   f. Thermal Conductivity: K value of 0.358 or density of 21.61 pcf per ASTM C518.
   g. Microbial and Fungal Resistance for Interior and Exterior: Comply with ASTM G21.
5. Color: High gloss white.
6. Fasteners: Reusable, snap-locking fasteners with no sharp or abrasive external surfaces. **No cable ties allowed.**

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.

B. Verify that electric power is available and of the correct characteristics.

C. Confirm that millwork is constructed with adequate provision for the installation of lavatories and sinks, and **confirm that lavatory and sink mounting types (undermount, drop-in, integral, etc.) match those called for on Architectural Millwork drawings and details.**

3.2 INSTALLATION

A. Install per manufacturer's instructions.

B. Install fixtures at heights indicated on drawings.

C. Provide chrome-plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.

D. Install components level and plumb.

E. Showers:

1. Shower Pans: After installation of the pan, finished floor, and drain, the installer shall pour approximately 3-5 gallons of water into the shower, let the water level sit for 1 hour, verify that it holds water, then drains properly before finalizing installation. If assembly fails test, investigate cause and fix prior to testing again.

3.3 INTERFACE WITH WORK OF OTHER SECTIONS

A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.4 ADJUSTING

A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.5 CLEANING

A. Clean plumbing fixtures and equipment.

3.6 PROTECTION

A. Protect installed products from damage due to subsequent construction operations.

B. Do not permit use of fixtures by construction personnel.

C. Repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 22 40 00

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SECTION 23 00 50 - COMMON WORK RESULTS FOR MECHANICAL

PART 1 GENERAL

1.1 APPLICABILITY

A. The instructions outlined in this section shall apply to all sections under Division 23, except where specifically noted otherwise in the individual specification sections. Where these instructions and the instructions contained in other sections deviate, the more stringent requirement shall stand.

1.2 RELATED REQUIREMENTS

A. Section 01 10 00 - Summary: Contract descriptions, description of alterations work, work by others, future work, occupancy conditions, use of site and premises, work sequence.

B. Section 01 30 00 - Administrative Requirements: Submittal procedures, project meetings, progress schedules and documentation, reports, coordination.

C. Related Documents: Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to and supplement all work specified in Division 23. If conflicts arise, Contractor shall be responsible for communicating the conflict to Contracting Officer prior to performing any work or ordering any equipment. The Mechanical Drawings are diagrammatic except where specifically indicated otherwise. Refer to Architectural, Structural, and Civil drawings for all building dimensions.

1.3 DEFINITIONS

A. Exposed: Revealed to view or subject to weather.

B. Fittings: All connecting pieces of a system.

C. Provide: Furnish, install, and connect completely.

D. Piping: Pipe installed with all required fittings, valves, and accessories, and forming a complete system.

E. Wiring: Wire or cable installed in raceway with all required boxes, fittings, connectors, and accessories completely installed.

1.4 CODES AND STANDARDS

A. These specifications and associated design drawings do not give permission, implicit or inferred, to ignore the requirements of the applicable building codes or the AHJ. By placing a bid on this project, Contractor acknowledges and agrees to the requirement that they shall be versed in all applicable code requirements relevant to this specific project, and shall bring any conflicts to the attention of the Contracting Officer prior to performing any work. If work performed is found to be in violation of code, Contractor shall rectify any such work at their own expense.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of all equipment and systems with size, location and installation of service utilities.

B. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner, and that coordination between all affected installers has been performed to ensure proper installation order of all systems (e.g., electrical, plumbing, fire protection, millwork, etc.).

C. The locations, arrangement, and extent of equipment, devices, piping, and other appurtenances related to the installation of the Mechanical work shown on the drawings are approximate and define the intent of the design. Contractor shall not scale the Engineer's drawings but shall refer to the Architectural drawings for exact dimensions of building components. Should a conflict exist between the Architectural and Engineering drawings regarding dimensions and scale, notify Contracting Officer of the discrepancy.

1.6 PERMITS, UTILITIES, SERVICES, AND FEES

A. Obtain all permits, inspections and approvals as required by Authority Having Jurisdiction (AHJ) and deliver certificates of approval to the Contracting Officer. Assume and pay all fees and costs of any nature whatsoever incidental to these permits.

1.7 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Mechanical systems and all associated equipment, piping, accessories, and specialties shall not be installed without first coordinating the installation of the same with all other building trades (Architectural, Structural, Plumbing, etc.). Coordination shall be accomplished prior to, and shall be reflected in, the equipment submittals for approval. See individual sections for details.

C. SHOP DRAWINGS:

1. Where indicated in these specifications or on drawings, submit Mechanical shop drawings for review by the Government and the Contracting Officer prior to beginning work. Background information shall be CAD or other computer-drawn versions of the floor plans or reflected ceiling plans of the Contract Drawings. Drawing from the Contract Documents shall not be copied for use as backgrounds, and hand drawings or sketch "markups" of the Contract Drawings shall not be accepted.
2. Submit Mechanical shop drawings for all Mechanical Rooms that show coordination and sizes between all equipment, piping, ductwork, and other discipline systems.
    a. Drawings from the Contract Documents Plan shall detail major elements, components, and system elements of Mechanical systems and materials in relation to other systems, installations, and building components. Sheet metal work shall be drawn using symbols and designations found in the lastest edition of SMACNA *Duct Construction Standards - Metal and Flexible*.
    b. Show detailed space requirements for installation and maintenance access after installation is complete.
    c. Indicate if sequence and coordination of installations with other trades are important to efficient flow of the work.
    d. Include the following, at a minimum:

1) Ductwork and equipment layouts, shown coordinated with required maintenance access for mechanical, electrical, structural, and fire protection equipment and systems, including space for disassembly required for periodic maintenance.
2) Dampers and valves, with access shown coordinated with architectural ceilings and furniture, and coordinated damper placement or damper cabling used to omit access panels in walls or ceilings wherever possible.
3) Equipment and accessory service connections and support details.
4) Location of all control equipment (e.g., thermostats, humidistats, VFDs, control panels, etc.), coordinated with architectural furniture, and with all electrical power connections provided by others.
5) Exterior wall and foundation penetrations.
6) Rated wall and floor penetrations (e.g., fire, smoke, etc.).

D. ELECTRICAL COORDINATION STATEMENT: Submit a written statement confirming coordination of voltage and power connection requirements with all Mechanical equipment and controls submittals requiring an electrical connection. Statement shall bear the names and signatures of the Mechanical and Electrical subcontractors. Equipment that is connected to incorrect voltages for any reason shall be replaced at Contractor's expense.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Unless specifically noted otherwise in the specifications or drawings, all products shall be manufactured by a company specializing in manufacturing the specific products used in this project, with at least three years of documented experience.

B. Fabricator Qualifications: Unless specifically noted otherwise in the specifications or drawings, a company specializing in fabricating the specific products used in this project, with at least three years of documented experience.

C. Installer Qualifications: Unless specifically noted otherwise in the specifications or drawings, a company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

D. **NOTICE: Manufacturer's Startup Representative Qualifications:** Unless specifically noted otherwise in the specifications or drawings, when the project documents specify startup services by a manufacturer's factory technician or representative, those services may not be delegated to the contractor or subcontractor who performed the installation, but must be provided directly by the manufacturer's personnel or by the manufacturer's contracted independent third party representative.

E. Copies of Documents at Project Site: Maintain at the project site a copy (or provide access to a digital copy) of each referenced document that prescribes execution requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store all products and equipment under cover and elevated above grade, protected completely against weather. Do not install materials or equipment in a partially constructed structure exposed to weather, unless all material and equipment is continuously protected from damage by weather or the construction process. Comply with all manufacturer requirements for safe and effective storage of each product. Where Manufacturer's instructions and these specifications differ, maintain the more stringent standard.

B. Products such as refrigerant piping and fittings that are stored outside must be protected against contamination by the elements within sealed plastic containers, or must be plugged and purged per the manufacturer's recommendations to ensure no damage to the inside of the piping.

C. Ductwork and air terminals are required to be covered and stored protected from dust and debris in accordance with most current edition *SMACNA Duct Cleanliness for New Construction Guidelines* "Intermediate" Duct Cleanliness Level unless specifically noted otherwise.

D. Material and equipment with suspected or observable damage caused by improper protection during construction is subject to replacement based on the judgment of Contracting Officer at no cost to the Contract.

1.10 WARRANTY

A. The installation and mechanical equipment and components shall be provided with a one-year warranty from the date of final acceptance by Government unless specifically noted otherwise in the contract documents. The warranty shall cover all materials and workmanship. During this warranty period, correct all defects in materials and workmanship by repair or replacement without incurring any additional cost to the owner. Warranty defects shall be corrected within thirty (30) days after being notified in writing of failure to meet the warranty.

B. Provide manufacturer warranty for all air conditioning compressors for an additional four years beyond the initial one-year warranty. This additional warranty shall include parts at a minimum.

C. Provide manufacturer warranty for all heat exchangers for an additional nine years beyond the initial one-year warranty. This additional warranty shall include parts at a minimum.

D. Correct any and all defective Work uncovered within a five year period after Date of Substantial Completion.

E. See Section 01 78 00 - Closeout Submittals, as well as all individual specifications sections for additional warranty requirements.

1.11 ELECTRICAL SYSTEMS INTERFACE

A. All control wiring and associated raceway systems serving mechanical systems shall be provided under Division 23 unless specifically shown on Electrical drawings or Division 26 specifications.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. If substitution of alternate equipment is requested, Contractor is responsible for any and all costs required by the requirements of section 01 33 23-Submittal Procedures, including necessary engineering and construction revisions in their – or any – contract or trade to satisfy the design intent shown on the Drawings and described in the Specifications.

B. If the products and equipment used as the basis of design are modified, coordinate with all other trades prior to purchasing any material or equipment. Such coordination shall occur before

purchasing and delivering equipment from the manufacturer and shall be clearly indicated on the shop drawings. Perform all related modifications without incurring cost to the Contract.

2.2 MATERIALS

A. All products shall be new and shall bear the Underwriter's Laboratories, Inc. (UL) label or the Factory Mutual Underwriters (FM) label unless specifically indicated otherwise. Furnish materials and equipment compatible with the existing system.

B. Materials, equipment, or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications are not intended to indicate every item of material, equipment, or labor required to produce a complete and properly functioning installation.

C. FLAME SPREAD AND SMOKE DEVELOPED RATINGS OF MATERIALS:

1. Materials and adhesives used throughout the mechanical systems for any system shall have a flame spread rating not over 25, and a smoke developed rating not to exceed 50. If such materials are to be applied with adhesives, test them as applied with such adhesives, or the adhesives used shall have a flame spread rating not over 25 and a smoke developed rating not to exceed 50.
2. Determine flame spread rating and smoke developed rating by the Method of Testing of Surface Burning Characteristics of Building Materials, NFPA 255, ASTM E84, and Underwriters' Laboratories, Inc. standards.

2.3 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Provide materials and equipment that are standard products of manufacturers regularly engaged in the manufacture of such products, which are of a similar material, design and workmanship. Standard products must have been in satisfactory commercial or industrial use for three years prior to bid opening. The three-year use must include applications of equipment and materials under similar circumstances and of similar size. The product must have been for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures during the three-year period.

1. Products having less than a three-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturer's factory or laboratory tests, can be shown.

PART 3 EXECUTION

3.1 GENERAL

A. The mechanical, plumbing, and fire protection drawings do not give exact elevations or location of lines, nor do they show all the offsets, control lines or installation details. Carefully lay out the work at the site to conform to the structural conditions, to provide proper grading of lines, to avoid all obstructions.

B. Offset valves in piping systems down to within one foot of the access point. Group runs of piping whenever it is feasible to do so.

C. Do not install piping, equipment or ductwork in electrical rooms, elevator machine rooms or electronic data rooms except as serving only those rooms. Do not run piping or ductwork or locate equipment with respect to switchboards, panelboards, power panels, motor control centers or dry type transformers. Clearances apply vertically from floor to structure:

1. Within 42" in front of electrical equipment.
2. Within 36" of sides of electrical equipment.

D. Provide access to equipment and valves requiring operation, service or maintenance within the life of the system. Equipment located above lay-in type ceilings is considered accessible.

E. Valves and dampers for terminal units, grilles, or diffusers shall be located in areas accessible for maintenance and adjustment. Where dampers are installed above hard ceilings, provide damper adjustment cabling to allow remote adjustment of the damper without the use of an access panel.

3.2 EXAMINATION

A. Verification of Conditions: Verify existing conditions and operability of all existing equipment and systems prior to beginning work.

3.3 INSTALLATION

A. Install all equipment and materials in accordance with manufacturer's instructions.

B. Minor deviations from the drawings required to conform to space conditions and to provide the required operation, service, or maintenance accessibility shall be made at no additional cost, and shall be subject to approval by the Government.

C. At the discretion of the Government, the Contracting Officer, or the Authority Having Jurisdiction (AHJ) , relocate all conflicts arising from uncoordinated piping, equipment, ductwork, etc. installed, should such installation be determined to interfere with the proper installation and mounting of equipment, ceilings, piping, conduit, or any other Architectural or Structural systems or finishes. Corrective work arising from these conditions shall be performed without additional expense to the contract.

1. Stacking of piping, conduit, ductwork, etc. where it would cause an obstruction or restricted path for egress or serviceability of equipment from any trade is prohibited.
2. Coordinate the elevations of all piping and equipment above ceilings and in exposed areas with the work of all other disciplines prior to installation. In areas where more than one trade is required to use common openings in structure, joists, chases, shafts, and sleeves to route conduits, raceways, piping, ductwork, or any other materials, coordinate the positions of all piping and equipment to be furnished under this section so that all items – including the materials and equipment of other trades – may be accommodated within the space available.
3. Confirm that work to be performed under Division 23 does not interfere with the clearances required for finished soffits, columns, millwork, pilasters, partitions, walls, or other Architectural or Structural elements as shown on the Drawings or Specifications. Work that interferes with the Architectural design or building structure shall be removed and relocated at the direction of the Contracting Officer at no additional cost to the contract.

4. All piping and ductwork shall be run tight to structure, regardless of whether piping, ductwork, and equipment are above or below structural elements. Free-standing piping and equipment spanning open spaces or voids is prohibited. All piping routed through areas with exposed ceilings, cloud ceilings, or any other areas where piping may be visible to building occupants shall be routed to maintain a low-profile installation or shall be hidden from view, to provide the least-visible installation possible.
    a. If any of these conditions are identified in the field by the Government, the Contracting Officer, or the AHJ, remove and reinstall the indicated piping, ductwork, or equipment in accordance with these directions at no additional cost to the Contract.
    b. If there are areas where necessary routing cannot comply with these instructions, furnish a sketch to the Contracting Officer identifying such areas and how the design drawing routing in the indicated areas will differ from these instructions, and obtain written approval to proceed with the proposed routing from the Contracting Officer prior to installation.
5. Give full cooperation to other trades and furnish all information necessary to permit the work of all trades to be installed satisfactorily, and with the least possible interference or delay.

D. SEISMIC AND WIND DESIGN

1. Install hangers and supports to allow controlled thermal and seismic movement of piping and ductwork systems and mechanical equipment, to permit freedom of movement between pipe/duct anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units, and to protect similar exterior-mounted components and equipment against the effects of high velocity winds. See Structural drawings for project Seismic Design Classification and for Wind Design Classification.
2. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

E. Piping, equipment, or ductwork shall not be installed in electrical equipment rooms, unless such piping serves equipment inside these spaces exclusively. Do not locate or route piping, ductwork, or equipment within 42" in front (and rear, if free-standing) of electrical equipment, or within 36" of sides of equipment. Clearances shall apply from floor level to underside of structural deck, and shall apply to the following electrical equipment:

1. Switchboards
2. Panel boards
3. Power panels
4. Motor control centers
5. Dry-type transformers

3.4 SLEEVES AND FRAMES

A. Install in concrete, carpentry or masonry construction, all sleeves, frames, hangers, expansion bolts, inserts and other fixtures and appurtenances indicated on the drawings or in these specifications for the support of all pipe, duct, equipment and devices furnished under Division 23.

B. Cut openings and install sleeves or frames through walls and surfaces in a neat workmanlike manner. Cut openings only as large as required for the installation. Install sleeves and/or frames flush with finished surfaces and grout in place unless otherwise indicated. Leave surfaces around openings smooth and finish to match surrounding surface.

C. Where pipes pass through floor slabs above grade, sleeves shall be standard weight black steel pipe with top of sleeve 1 inch above finished floor. Where pipes pass through walls above grade, sleeves shall be standard weight black steel pipe or 20-gauge galvanized sheet metal with ends flush with both surfaces. For sleeves and sleeve seals below grade, see Section 23 05 17 - Sleeves and Sleeve Seals for Underground HVAC Piping.

D. Provide each pipe or duct passing through walls, floors, ceilings or partitions with sleeves having an internal diameter 1 inch larger that the outside dimensions of the insulated pipe or duct.

E. New Construction Projects:

1. Build all pipe sleeves through floors, roofs and masonry walls in place as the affected walls, floors and roofs are built.

F. Pack all penetrations through rated walls and floors with mineral wool and cap off with an approved fire-rated sealant as manufactured by Hilti, 3M or Dow. Materials shall meet or exceed UL 1479 or ASTM E814 requirements.

G. Sleeves through exterior walls shall be steel pipe or cast iron pipe flush with both wall surfaces, and with the space between the pipe and the sleeve caulked watertight.

3.5 ESCUTCHEONS

A. Install escutcheons on all pipes where they pass through floors, ceilings, walls, or partitions in finished and exposed construction areas.

B. Escutcheons shall be split, hinged, stamped brass type designed to fit the pipe and to cover the terminating pipe sleeve. Escutcheons shall be chrome plated finish unless otherwise specified with a securing device to hold them tight to the pipe.

C. Allow sufficient spacing between parallel pipe runs to ensure installation of escutcheons without modification. Do not alter the escutcheons in any manner to allow for installation.

3.6 PAINTING

A. See Section 09 91 13 - Exterior Paintingfor general project painting specifications and instructions. Additionally, the following requirements in this section apply.

B. New equipment painting must be factory applied or shop applied, and must be as specified herein, and provided under each individual section.

C. Manufacturer's standard factory painting systems may be provided subject to certification that the factory painting system applied will withstand 125 hours in a salt-spray fog test, except that equipment located outdoors must withstand 500 hours in a salt-spray fog test. Salt-spray fog test must be in accordance with ASTM B117 and ASTM B-287, and for that test the acceptance criteria must be as follows: immediately after completion of the test, the paint must show no signs of blistering, wrinkling, or cracking, and no loss of adhesion; and the specimen must show no signs of rust creepage beyond 0.125 inch on either side of the scratch mark. The film

thickness of the factory painting system applied on the equipment must not be less than the film thickness used on the test specimen. If manufacturer's standard factory painting system is being proposed for use on surfaces subject to temperatures above 120 degrees F, the factory painting system must be designed for the temperature service.

D. Repaint factory painted equipment that has been scratched or marred to match original factory color.

E. Clean and paint all un-insulated black ferrous metal items exposed to sight inside the building such as piping, equipment hangers, and supports with one coat of zinc chromate primer. In addition, paint such items in finished spaces with two coats of finish paint in a color to match adjacent surfaces or as otherwise directed by the Contracting Officer.

F. Clean and paint black ferrous metal items exposed outside the building such as piping, cooling tower beams, un-insulated pipe, and pipe supports with one coat of rust inhibiting primer and two coats of an asphaltic base aluminum paint. Clean and paint all piping installed outside the building that is to be insulated with one coat of rust inhibiting primer before installing insulation.

G. Do not paint nameplates on equipment.

H. Re-coat galvanizing broken during construction with cold galvanizing compound.

I. Paint all ductwork, piping, insulation, conduit, structural members or other appurtenances visible through ceiling grilles flat black, unless specifically noted otherwise.

3.7 SYSTEM STARTUP

A. Independent Startup Verification: System startup services shall be performed by a manufacturer authorized and factory-trained technician that is independent from the installing contractor. Manufacturer shall be prohibited from delegating this duty to the installing contractor.

B. See individual specifications sections for systems startup instructions for systems and equipment.

3.8 CLEANING

A. Flush new water piping systems until water runs clean. Mild chemical cleaning may be required. If so, flush all cleaning chemicals out of the piping system before recharging with water.

B. Remove all stickers, rust, stains, labels and temporary covers before final acceptance.

C. Clean the interior of all ducts, plenums and casings of all debris and blow free all particles of rubbish and dust before installing outlet faces. If duct closure film is not properly used to protect all duct openings throughout the course of construction, or if directed by the Contracting Officer or Government, ducts shall be cleaned using the methods specified under Section 23 01 30.51 - HVAC Air-Distribution System Cleaning, at no additional cost to the Contract.

D. Lubricate bearings that require lubrication in accordance with the manufacturer's recommendations.

E. Provide temporary filters for any fans operated during construction. Change temporary filters regularly (minimum once per week) to prevent contamination of the equipment and duct systems. Install new and unused permanent filters one week prior to final inspection.

F. Cover ends of open ducts and pipes during construction except when working on such end prohibits covering, per SMACNA Duct Cleanliness Standards noted in Part 1. Cover with minimum 4 mil thick polyethylene taped, tied or wired in place.

G. Clean all mechanical and equipment rooms, equipment, and work areas. See Section 01 74 19 - Construction Waste Management and Disposal, for additional requirements regarding cleaning and disposal requirements, etc.

3.9 CLOSEOUT ACTIVITIES

A. See Section 01 78 23 – Operation and Maintenance Data.

B. Demonstration and Training: See Section 01 77 00 – Closeout Procedures, for primary requirements. See individual specifications sections for additional specific training and demonstration requirements for each system and equipment type.

3.10 MAINTENANCE

A. Provide a separate maintenance contract for the service and maintenance of all systems for 12 months from Date of Substantial Completion.

END OF SECTION 23 00 50

SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR UNDERGROUND HVAC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Pipe sleeves.

B. Manufactured sleeve-seal systems.

1.2 RELATED REQUIREMENTS

A. Section 09 91 13 - Exterior Painting: Preparation and painting of exterior piping systems.

B. Section 09 91 23 - Interior Painting: Preparation and painting of interior piping systems.

1.3 REFERENCE STANDARDS

A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type); 2024.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

1.4 SUBMITTALS

A. Product Data: For each product used in a rated assembly.

B. See Section 01 33 23-Submittal Procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store sleeve and sleeve seals in shipping containers, with labeling in place.

B. Provide temporary protective coating on cast iron and steel sleeves if shipped loose.

PART 2 PRODUCTS

2.1 PIPE SLEEVES

A. Vertical Piping:

1. Sleeve Length: 1 inch above finished floor.
2. Provide sealant for watertight joint.
3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.

B. Pipe Passing Through Below Grade Exterior Walls:

1. Zinc coated or cast iron pipe.
2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.

C. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:

1. Galvanized steel pipe or black iron pipe with asphalt coating.
2. Connect sleeve with floor plate except in mechanical rooms.

D. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the .

E. Clearances:

1. Provide allowance for insulated piping.
2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
3. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.

2.2 MANUFACTURED SLEEVE-SEAL SYSTEMS

A. Modular/Mechanical Seal:

1. High-temperature-silicone interlocking links shaped to fit surface of pipe such that they continuously fill annular space between pipe and wall/casing opening. Include type and number required by manufacturer for pipe material and size.
2. Designed to form a hydrostatic seal of minimum 20-psig.
3. Provide watertight seal between pipe and wall/casing opening.
4. Elastomer element size and material in accordance with manufacturer's recommendations.
5. Glass reinforced plastic or Carbon Steel pressure end plates.
6. Carbon Steel connecting Bolts and Nuts with corrosion-resistant coating, ASTM B633, of sufficient length to secure pressure plates to sealing elements in the manner prescribed by the manufacturer.

2.3 GROUT

A. Description: Nonshrink, recommended for interior and exterior sealing openings in nonfire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, 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.

2.4 SILICONE SEALANTS

A. Silicone Foam: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 EXECUTION

3.1 INSTALLATION

A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.

B. Install piping to conserve building space, to not interfere with use of space and other work, to maintain required maintenance clearances for all equipment, and to ensure the lowest visual impact possible.

C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

D. Structural Considerations:

1. Do not penetrate building structural members unless indicated on structural drawings.

E. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

1. Underground Piping: Seal pipe sleeve watertight with mechanically expandable chloroprene inserts with bitumen sealed metal components.
2. Aboveground Piping:
   a. Pack solid using mineral fiber in compliance with ASTM C592.
   b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
3. All Rated Openings: Caulk tight with fire stopping material in compliance with ASTM E814 in accordance with Section 07 84 00 to prevent the spread of fire, smoke, and gases.
4. Seal exterior wall sleeves watertight with mechanically expandable chloroprene inserts with mastic-sealed components.

F. Manufactured Sleeve-Seal Systems:

1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
3. Locate piping in center of sleeve or penetration.
4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
5. Tighten bolting for a water-tight seal.
6. Install in accordance with manufacturer's recommendations.

G. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

3.2 CLEANING

A. Upon completion of work, clean all parts of the installation.

B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

END OF SECTION 23 05 17

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SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING - HYDRONIC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Globe valves.

B. Ball valves.

C. Butterfly valves.

D. Check valves.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 23 05 53 - Identification for HVAC Piping and Equipment.

D. Section 23 07 19 - HVAC Piping Insulation.

1.3 REFERENCE STANDARDS

A. ASME B1.20.1 - Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).

B. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

C. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

D. ASME B16.10 - Face-to-Face and End-to-End Dimensions of Valves; 2022, with Errata (2023).

E. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings; 2021.

F. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

G. ASME B31.9 - Building Services Piping; 2020.

H. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2023).

I. ASTM A216/A216M - Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2021.

J. ASTM A536 - Standard Specification for Ductile Iron Castings; 1984 (Reapproved 2014).

K. ASTM B62 - Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.

L. AWWA C606 - Grooved and Shouldered Joints; 2022.

M. MSS SP-45 - Drain and Bypass Connections; 2020.

N. MSS SP-67 - Butterfly Valves; 2022.

O. MSS SP-71 - Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.

P. MSS SP-72 - Ball Valves with Flanged or Butt-Welding Ends for General Service; 2010a.

Q. MSS SP-80 - Bronze Gate, Globe, Angle, and Check Valves; 2019.

R. MSS SP-85 - Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.

S. MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .

T. MSS SP-125 - Check Valves: Gray Iron and Ductile Iron, In-Line, Spring-Loaded, Center-Guided; 2018.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.

1.5 QUALITY ASSURANCE

A. Manufacturer:

1. Obtain valves for each valve type from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use the following precautions during storage:

1. Maintain valve end protection and protect flanges and specialties from dirt.
   a. Provide temporary inlet and outlet caps.
   b. Maintain caps in place until installation.
2. Store valves in shipping containers and maintain in place until installation.
   a. Store valves indoors in dry environment.
   b. Store valves off the ground in watertight enclosures when indoor storage is not an option.

PART 2 PRODUCTS

2.1 APPLICATIONS

A. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).

B. Provide the following valves for the applications if not indicated on drawings:

1. Throttling (Hydronic): Butterfly, Ball, and Globe.
2. Isolation (Shutoff): Ball.
3. Silent Check (Pump Outlet):
   a. Size 2 inch and Smaller: Bronze with bronze disc.
   b. Size 2-1/2 inch and Larger: Iron with center-guided with resilient seat.
4. Dead-End: Butterfly, single-flange (lug) type.

C. Required Valve End Connections for Non-Wafer Types:

1. Steel Pipe:
   a. Size 2 inch and Smaller: Threaded ends.
   b. Size 2-1/2 inch and Larger: Grooved ends.
2. Copper Tube:
   a. Size 2 inch and Smaller: Threaded ends, except solder-joint valve-ends.
   b. Size 2-1/2 inch and Larger: Grooved ends.

D. Chilled Water Valves:

1. Size 2 inch and Smaller, Brass and Bronze Valves:
   a. Threaded ends.
   b. Ball: Full port, one piece, brass trim, Class 125.
   c. Swing Check: Bronze disc, Class 125 .
   d. Globe: Bronze disc, Class 125.
2. Size 2-1/2 inch and Larger, Iron Valves:
   a. 2-1/2 inch to 4 inch: Flanged ends.
   b. Single-Flange Butterfly: 2-1/2 inch to 12 inch, aluminum-bronze disc, EPDM seat, 200 CWP.
   c. Grooved-End Butterfly: 2-1/2 inch to 12 inch, minimum 175 CWP.
   d. Swing Check with Closure Control: 2-1/2 inch to 12 inch, center-guided with resilient seat, Class 125.
   e. Globe: Class 125.

2.2 GENERAL REQUIREMENTS

A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.

B. Valve Sizes: Match upstream piping unless otherwise indicated.

C. Valve Actuator Types:

1. Gear Actuator: Quarter-turn valves 8 inch and larger.
2. Handwheel: Valves other than quarter-turn types.
3. Hand Lever: Quarter-turn valves 6 inch and smaller.
4. Wrench: Plug valves with square heads.
5. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator, of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

D. Valves in Insulated Piping: Provide 2 inch stem extensions and the following features:

1. Ball Valves: Extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Memory Stops: Fully adjustable after insulation is installed.

E. Memory Stops: Fully adjustable after insulation is installed.

F. Valve-End Connections:

1. Threaded End Valves: ASME B1.20.1.
2. Flanges on Iron Valves: ASME B16.1 for flanges on iron valves.
3. Pipe Flanges and Flanged Fittings 1/2 inch through 24 inch: ASME B16.5.
4. Solder Joint Connections: ASME B16.18.
5. Grooved End Connections: AWWA C606.

G. General ASME Compliance:

1. Ferrous Valve Dimensions and Design Criteria: ASME B16.10 and ASME B16.34.
2. Building Services Piping Valves: ASME B31.9.

H. Bronze Valves:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

I. Valve Bypass and Drain Connections: MSS SP-45.

J. Source Limitations: Obtain each valve type from a single manufacturer.

2.3 BRONZE, GLOBE VALVES

A. CWP Rating: Class 125: 200 psi:

1. Comply with MSS SP-80, Type 1.
2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
3. Ends: Threaded or solder joint.
4. Stem and Disc: Bronze or PTFE.
5. Packing: Asbestos free.
   a. Handwheel: Malleable iron.

2.4 BRONZE, GLOBE VALVES

A. Ratings for Class 125 and Class 250:

1. Class 125:
   a. WOG Rating: 200 psi.
   b. WSP Rating: 125 psi, saturated.
2. Class 250: WOG Rating; 300 psi.
3. Comply with MSS SP-80, Type 1.
4. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
5. End Connections: Threaded or solder.
6. Bonnet: OS&Y; Rising Stem.
7. Nonrising Stem: Bronze.
8. Disc: Bronze, for open-loop condenser water systems use PTFE.
9. Packing: Asbestos free.
10. Handwheel Operator: Malleable Iron.

2.5 IRON, GLOBE VALVES

A. CWP Ratings: Class 125: 200 psi and Class 250: 500 psi:

1. Comply with MSS SP-85, Type I.
2. Body: Gray iron; ASTM A126, with bolted bonnet.
3. Ends: Flanged.
4. Trim: Bronze.
5. Packing and Gasket: Asbestos free.
6. Operator: Handwheel or chainwheel.

2.6 CARBON STEEL, GLOBE VALVES

A. Class 150:

1. Body: ASTM A216/A216M.
2. WOG Rating: 150 psi.
3. Bonnet: OS&Y; Rising Stem.
4. End Connections: Flanged.

5. Packing and Gasket: Asbestos free.
6. Operator: Malleable Iron handwheel.
7. Pressure and Temperature Rating: ASME B16.34.

2.7 BRONZE, BALL VALVES

A. General:

1. Fabricate from dezincification resistant material.
2. Copper alloys containing more than 15 percent zinc are not permitted.

B. One Piece, Reduced Port with Bronze Trim:

1. Comply with MSS SP-110.
2. CWP Rating: 400 psi.
3. Ends: Threaded.
4. Seats: PTFE.

C. Two Piece, Full Port with Bronze or Brass Trim:

1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. WOG Rating: 400 psi.
4. Body: Forged bronze or dezincified-brass alloy.
5. End Connections: Pipe thread or solder.
6. Seats: PTFE.
7. Stem: Bronze or brass.
8. Ball: Chrome plated brass.
9. Operator: Provide lockable handle and stem extension.

D. Three Piece, Full Port with Bronze or Brass Trim:

1. Comply with MSS SP-110.
2. WSP Rating: 150 psi.
3. CWP Rating: 600 psi.
4. End Connections: Pipe thread.
5. Seats: PTFE.
6. Stem: Bronze or brass.
7. Ball: Chrome plated brass.

2.8 CARBON STEEL, BALL VALVES

A. Class 150, Full Port, Stainless Steel Trim, Flanged:

1. Comply with MSS SP-72.
2. WOG Rating: 300 psi.
3. WSP Rating: 150 psi.
4. Body: Carbon steel, ASTM A216/A216M, Type WCB.
5. Seats: PTFE.
6. Stem: Stainless steel.
7. Ball: Stainless steel, vented.
8. Size: 1/2 to 12 inches.

B. Class 150, Full Port, Stainless Steel Trim, Threaded with Lockable Handle:

1. WOG Rating: 125 psi.
2. WSP Rating: 150 psi.
3. Vacuum Rating: 14.2 psi.
4. Body: Carbon steel, ASTM A216/A216M.
5. Seats: PTFE.
6. Stem: Stainless steel.
7. Ball: Stainless steel.
8. Size: 1/4 to 2 inches.

2.9 IRON, GROOVED-END BALL VALVES

A. Class 200:

1. CWP Rating: 600 psi.
2. Body: Ductile iron; ASTM A536, Grade 65-45-12.
3. Ends: Grooved.
4. Seats: Teflon.
5. Stem: Nickel plated carbon steel.
6. Ball: NIckel plated carbon steel or Type 304 stainless steel.

2.10 IRON, SINGLE FLANGE BUTTERFLY VALVES

A. Lug Style:

1. Comply with MSS SP-67, Type I.
2. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
3. Stem: One or two-piece stainless steel.
4. Seat: EPDM, or NBR for all glycol applications.
5. Disc: Aluminum-bronze.

2.11 IRON, GROOVED-END BUTTERFLY VALVES

A. CWP Rating: Minimum 175 psi.

1. Comply with MSS SP-67, Type I.
2. Body: Coated ductile iron.
3. Stem: Two-piece stainless steel.
4. Disc: Coated ductile iron.
5. Disc Seal: EPDM, or NBR for all glycol applications.

2.12 BRONZE, SWING CHECK VALVES

A. Class 150:

1. Pressure and Temperature Rating: MSS SP-80, Type 3.
2. Design: Y-pattern, horizontal or vertical flow.
3. CWP Rating: 300 psi.
4. Body: Bronze, ASTM B62.
5. End Connections: Threaded or soldered.
6. Disc: Center-guided resilient seat Bronze.

2.13 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125:

1. Comply with MSS SP-71, Type I.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Body Design: Clear or full waterway.
4. Body Material: ASTM A126, gray iron with bolted bonnet.
5. Ends: Flanged.
6. Trim: Bronze.
7. Gasket: Asbestos free.
8. Closer Control: Factory installed, exterior lever, and center-guided resilient seat spring .

2.14 CARBON STEEL, SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 150:

1. Design: T-pattern, horizontal or vertical flow.
2. Body and Disc: ASTM A216/A216M.
3. CWP Rating: 150 psi.
4. End Connections: Flanged.
5. Pressure and Temperature Rating: ASME B16.34.
6. Closer Control: Factory installed, exterior lever, and spring.

2.15 IRON, CENTER-GUIDED CHECK VALVES

A. Class 125, Compact-Wafer:

1. Comply with MSS SP-125.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Sizes 14 to 24 inch: CWP Rating; 150 psi.
4. Body Material: ASTM A126, gray iron or cast iron.
5. Resilient Seat: EPDM, or NBR for all glycol applications.

B. Class 125, Globe:

1. Comply with MSS SP-125.
2. Sizes 2-1/2 to 12 inch: CWP Rating; 200 psi.
3. Sizes 14 to 24 inch: CWP Rating; 150 psi.
4. Body Material: ASTM A126, gray iron or cast iron.
5. Style: Spring loaded.
6. Ends: Flanged.
7. Resilient Seat: EPDM, or NBR for all glycol applications.

PART 3 EXECUTION

3.1 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

B. Verify valve parts to be fully operational in all positions from closed to fully open.

C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.

D. Should valve is determined to be defective, replace with new valve.

3.2 INSTALLATION

A. Provide isolation ball valve for every connection to equipment, regardless of presence on drawings. Isolation valves shall be installed in accessible location, and shall be located within 3'-0" from the piece of equipment it serves.

B. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.

C. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

D. Install check valves where necessary to maintain direction of flow as follows:

1. Swing Check: Install horizontal maintaining hinge pin level.
2. Orient plate-type and center-guided into horizontal or vertical position, between flanges.

E. Provide chainwheels on operators for valves 4 NPS and larger where located 96 NPS or more above finished floor, terminating 60 NPS above finished floor.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment components.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

E. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
2. Coordinate the work with other trades to provide additional framing and materials required for installation.
3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
5. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 03 30 00.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, post-installed concrete and masonry anchors, thermal insulated pipe supports, all refrigerant piping supports, and cold galvanizing compound.

C. Shop Drawings: Include details for fabricated hangers and supports where materials or methods other than those indicated are proposed for substitution.

1. Application of protective inserts, saddles, and shields at pipe hangers for each type of insulation and hanger.

D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 QUALITY ASSURANCE

A. Comply with applicable building code.

B. For all seismic systems: Installer Qualifications for Powder-Actuated Fasteners (when specified): Certified by fastener system manufacturer with current operator's license.

C. For all seismic systems: Installer Qualifications for Field-Welding: As specified in Section 05 50 00.

D. For all seismic systems: Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of 3.0. Include consideration for vibration, equipment operation, and shock loads where applicable.
4. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
e. Stainless Steel: 304 or 316 Stainless Steel.

B. Prefabricated Trapeze-Framed Metal Strut Systems:

1. Strut Channel or Bracket Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.
2. Minimum Channel Thickness: Steel sheet, 12 gauge, 0.1046 inch.
3. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
4. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.

C. Hanger Rods:

1. Threaded zinc-plated steel unless otherwise indicated.
2. Minimum Size, Unless Otherwise Indicated or Required:
   a. Equipment Supports: 1/2 inch diameter.
   b. Piping up to 1 inch: 1/4 inch diameter.
   c. Piping larger than 1 inch: 3/8 inch diameter.
   d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.

D. Cable Hanging System Kits:

1. Provide cable-wire in bulk or precut lengths with respective cable hangers as required to hold minimum weight of 120 lb.
2. Accessories: Provide brackets, clip or c-clip hangers, covers, and y-hook hangers.

E. Thermal Insulated Pipe Supports:

1. General Requirements:
   a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
   b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
   c. Pipe supports to be provided for nominally sized, 1/2 to 30 inch iron pipes.
   d. Insulation inserts to consist of rigid polyisocyanurate (urethane) insulation surrounded by a 360 degree, PVC jacketing.
2. PVC Jacket:
   a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
   b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.

c. Thickness: 60 mil.

F. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.

G. Nonpenetrating Rooftop Supports for Low-Slope Roofs:

1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.

H. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
4. Hollow Masonry: Use toggle bolts.
5. Hollow Stud Walls: Use toggle bolts.
6. Sheet Metal: Use sheet metal screws.
7. Wood: Use wood screws.
8. Plastic and lead anchors are not permitted.
9. Hammer-driven anchors and fasteners are not permitted.
10. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    a. Comply with MFMA-4.
    b. Channel Material: Use galvanized steel.
    c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
11. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive support and attachment components.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.

D. Unless specifically indicated or approved by Contracting Officer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Contracting Officer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.

H. Equipment Support and Attachment:

1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls.
3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

I. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

J. Secure fasteners according to manufacturer's recommended torque settings.

K. Remove temporary supports.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using cold galvanizing compound recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 23 05 29

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SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Nameplates.

B. Tags.

C. Adhesive-backed duct markers.

D. Pipe markers.

E. Ceiling tacks.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Identification painting.

1.3 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2023.

B. ASTM D709 - Standard Specification for Laminated Thermosetting Materials; 2017.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

PART 2 PRODUCTS

2.1 IDENTIFICATION APPLICATIONS

A. Air Handling Units: Nameplates.

B. Air Terminal Units: Tags.

C. Automatic Controls: Tags. Key to control schematic.

D. Control Panels: Nameplates.

E. Dampers: Ceiling tacks, where located above lay-in ceiling.

F. Ductwork: Duct Markers.

G. Major Control Components: Nameplates.

H. Piping: Pipe markers.

I. Small-sized Equipment: Tags.

J. Thermostats: Nameplates.

K. Valves: Tags and ceiling tacks where located above lay-in ceiling.

2.2 NAMEPLATES

A. Letter Color: White.

B. Letter Height: 1/4 inch.

C. Background Color: Black.

D. Plastic: Comply with ASTM D709.

2.3 TAGS

A. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.

B. Metal Tags: Brass with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges.

2.4 ADHESIVE-BACKED DUCT MARKERS

A. Material: High gloss acrylic adhesive-backed vinyl film 0.0032 inch; printed with UV and chemical resistant inks.

B. Style: Individual Label.

C. Color Table:

System Type:	Color
Supply Air	Blue/White
Return Air	Green/White
Exhaust Air	Green/White
100% Outside Air	Blue/White
Hazardous Exhaust Air	Yellow/White

2.5 PIPE MARKERS

A. Color: Comply with ASME A13.1.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

D. Color code as follows:

1. Heating and Cooling: Green with white letters.

2.6 CEILING TACKS

A. Description: Steel with 3/4 inch diameter color coded head.

B. Color code as follows:

1. HVAC Equipment: Yellow.
2. Fire Dampers and Smoke Dampers: Red.

PART 3 EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B. Install tags with corrosion resistant chain.

C. Install plastic pipe markers in accordance with manufacturer's instructions.

D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

E. Identify service, flow direction, and pressure.

F. Install in clear view and align with axis of piping.

G. Install piping with pipe markers. Include System Type (e.g. Refrigerant Suction) and Flow Direction (with arrow). Locate piping identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.

H. Install ductwork with adhesive-backed duct markers. Include System Type (e.g. Supply Air) and Airflow Direction (with arrow). Locate identification at air handling unit or appliance, at each side of penetration of structure or enclosure, at each obstruction, and at every 25 feet.

I. Locate ceiling tacks to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION 23 05 53

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SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Testing, adjustment, and balancing of air systems.

B. Measurement of final operating condition of HVAC systems.

C. Sound measurement of equipment operating conditions.

D. Commissioning activities.

1.2 RELATED REQUIREMENTS

A. Section 01 40 00 - Quality Requirements: Employment of testing agency and payment for services.

B. Section 01 91 13 - General Commissioning Requirements: Commissioning requirements that apply to all types of work.

C. Section 23 08 00 - Commissioning of HVAC.

D. Section 25 05 00 - Common Work Results for Integrated Automation.

1.3 REFERENCE STANDARDS

A. AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition; 2016.

B. ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2024.

C. NEBB (TAB) - Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems; 2019, with Errata (2022).

D. SMACNA (TAB) - HVAC Systems Testing, Adjusting and Balancing; 2023.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.

1. Submit to the Commissioning Authority.
2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Contracting Officer and other installers to sufficiently understand the design intent for each system.
4. Include at least the following in the plan:
    a. List of all air flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
    b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
d. Final test report forms to be used.
e. Details of how TOTAL flow will be determined; for example:
    1) Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
f. Confirmation of understanding of the outside air ventilation criteria under all conditions.
g. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
h. Method of checking building static and exhaust fan and/or relief damper capacity.
i. Proposed selection points for sound measurements and sound measurement methods.
j. Time schedule for TAB work to be done in phases (by floor, etc.).
k. Time schedule for deferred or seasonal TAB work, if specified.
l. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
m. Interstitial cavity differential pressure measurements and calculations, if specified.
n. Procedures for field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).
o. Procedures for formal deficiency reports, including scope, frequency and distribution.

C. Field Logs: Submit at least twice a week to the Commissioning Authority.

D. Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.

E. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

1. Submit to the the Commissioning Authority within two weeks after completion of testing, adjusting, and balancing.
2. Revise TAB plan to reflect actual procedures and submit as part of final report.
3. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Contracting Officer and for inclusion in operating and maintenance manuals.
4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
6. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:
   1. AABC (NSTSB), AABC National Standards for Total System Balance.
   2. ASHRAE Std 111, Practices for Measurement, Testing, Adjusting and Balancing of Building Heating, Ventilation, Air-Conditioning, and Refrigeration Systems.
   3. SMACNA (TAB).
   4. Maintain at least one copy of the standard to be used at project site at all times.

B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.

C. Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.

D. TAB Agency Qualifications:
   1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
   2. Having minimum of three years documented experience.
   3. Certified by one of the following:
      a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
      b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
      c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.

E. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.2 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire, smoke, and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.

11. Duct system leakage is minimized.

B. Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.

C. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Hold a pre-balancing meeting at least one week prior to starting TAB work.

1. Require attendance by all installers whose work will be tested, adjusted, or balanced.

B. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Contracting Officer to facilitate spot checks during testing.

3.4 ADJUSTMENT TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 5 percent of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.5 RECORDING AND ADJUSTING

A. Field Logs: Maintain written logs including:

1. Running log of events and issues.
2. Discrepancies, deficient or uncompleted work by others.
3. Contract interpretation requests.
4. Lists of completed tests.

B. Ensure recorded data represents actual measured or observed conditions.

C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

D. Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.

E. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

F. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

G. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Government.

3.6 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.

B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

C. Measure air quantities at air inlets and outlets.

D. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

E. Use volume control devices to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

F. Vary total system air quantities by adjustment of fan speeds via Variable Frequency Drive (VFD) or Electronically Commutated Motor (ECM) adjustments. Provide drive changes required. Vary branch air quantities by damper regulation.

G. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.

H. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.

I. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

J. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

K. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.

L. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches positive static pressure near the building entries. Maintain any and all additional pressure relationships shown on the drawings.

M. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

3.7 COMMISSIONING

A. See Sections 01 91 14 – Total Building Commissioning and 23 08 00 for additional requirements.

B. Perform prerequisites prior to starting commissioning activities.

C. Fill out Pre-functional Checklists for:

1. Air side systems.
2. Water side systems.

D. Furnish to the Commissioning Authority, upon request, any data gathered but not shown in the final TAB report.

E. Re-check minimum outdoor air intake flows and maximum and intermediate total airflow rates for 25% percent of the air handlers plus a random sample equivalent to 10% percent of the final TAB report data as directed by Commissioning Authority.

1. Original TAB agency shall execute the re-checks, witnessed by the Commissioning Authority.
2. Use the same test instruments as used in the original TAB work.

3. Failure of more than 10 percent of the re-checked items of a given system shall result in the rejection of the system TAB report; rebalance the system, provide a new system TAB report, and repeat random re-checks.
4. For purposes of re-check, failure is defined as follows:
   a. Air Flow of Supply and Return: Deviation of more than 10 percent of instrument reading.
   b. Minimum Outside Air Flow: Deviation of more than 20 percent of instrument reading; for inlet vane or VFD OSA compensation system using linear proportional control, deviation of more than 30 percent at intermediate supply flow.
   c. Temperatures: Deviation of more than one degree F.
   d. Air and Water Pressures: Deviation of more than 10 percent of full scale of test instrument reading.
   e. Sound Pressures: Deviation of more than 3 decibels, with consideration for variations in background noise.
5. For purposes of re-check, a whole system is defined as one in which inaccuracies will have little or no impact on connected systems; for example, the air distribution system served by one air handler or the hydronic chilled water supply system served by a chiller or the condenser water system.

F. In the presence of the Commissioning Authority, verify that:

1. Final settings of all valves, splitters, dampers and other adjustment devices have been permanently marked.
2. The air system is being controlled to the lowest possible static pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from fan to diffuser having all balancing dampers wide open and that during full cooling of all terminal units taking off downstream of the static pressure sensor, the terminal unit on the critical leg has its damper 90 percent or more open.
3. The water system is being controlled to the lowest possible pressure while still meeting design loads, less diversity; this shall include a review of TAB methods, established control setpoints, and physical verification of at least one leg from the pump to the coil having all balancing valves wide open and that during full cooling the cooling coil valve of that leg is 90 percent or more open.

3.8 SCOPE

A. Test, adjust, and balance the following:

1. HVAC Pumps.
2. Air Cooled Chilles.
3. Air Cooled Refrigerant Condensers.
4. Air Handling Units, including Fan Coil Units.
5. Fans.
6. Air Filters.
7. Air Terminal Units.
8. Air Inlets and Outlets.
9. VRF System

10. Dedicated Outdoor Air Unts

3.9 MINIMUM DATA TO BE REPORTED

A. Electric Motors:

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.

B. Pumps:

1. Manufacturer.
2. Size/model.
3. Impeller.
4. Service.
5. Design flow rate, pressure drop, BHP.
6. Actual flow rate, pressure drop, BHP.
7. Discharge pressure.
8. Suction pressure.
9. Total operating head pressure.
10. Shut off, discharge and suction pressures.
11. Shut off, total head pressure.

C. Air Cooled Condensers:

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Serial number.
6. Entering DB air temperature, design and actual.
7. Leaving DB air temperature, design and actual.
8. Number of compressors.

D. Chillers:

1. Identification/number.
2. Manufacturer.
3. Capacity.
4. Model number.
5. Serial number.
6. Entering water temperature, design and actual.
7. Leaving water temperature, design and actual.
8. Pressure drop, design and actual.

E. Cooling Coils:

1. Identification/number.

2. Location.
3. Service.
4. Manufacturer.
5. Air flow, design and actual.
6. Entering air DB temperature, design and actual.
7. Entering air WB temperature, design and actual.
8. Leaving air DB temperature, design and actual.
9. Leaving air WB temperature, design and actual.
10. Water flow, design and actual.
11. Water pressure drop, design and actual.
12. Entering water temperature, design and actual.
13. Leaving water temperature, design and actual.
14. Saturated suction temperature, design and actual.
15. Air pressure drop, design and actual.

F. Electric Duct Heaters:

1. Manufacturer.
2. Identification/number.
3. Location.
4. Model number.
5. Design kW.
6. Number of stages.
7. Phase, voltage, amperage.
8. Test voltage (each phase).
9. Test amperage (each phase).
10. Air flow, specified and actual.
11. Temperature rise, specified and actual.

G. Air Moving Equipment:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Arrangement/Class/Discharge.
6. Air flow, specified and actual.
7. Return air flow, specified and actual.
8. Outside air flow, specified and actual.
9. Total static pressure (total external), specified and actual.
10. Inlet pressure.
11. Discharge pressure.
12. Sheave Make/Size/Bore.
13. Number of Belts/Make/Size.
14. Fan RPM.

H. Return Air/Outside Air:

1. Identification/location.

2. Design air flow.
3. Actual air flow.
4. Design return air flow.
5. Actual return air flow.
6. Design outside air flow.
7. Actual outside air flow.
8. Return air temperature.
9. Outside air temperature.
10. Required mixed air temperature.
11. Actual mixed air temperature.
12. Design outside/return air ratio.
13. Actual outside/return air ratio.

I. Exhaust Fans:

1. Location.
2. Manufacturer.
3. Model number.
4. Serial number.
5. Air flow, specified and actual.
6. Total static pressure (total external), specified and actual.
7. Inlet pressure.
8. Discharge pressure.
9. Sheave Make/Size/Bore.
10. Number of Belts/Make/Size.
11. Fan RPM.

J. Duct Traverses:

1. System zone/branch.
2. Duct size.
3. Area.
4. Design velocity.
5. Design air flow.
6. Test velocity.
7. Test air flow.
8. Duct static pressure.
9. Air temperature.
10. Air correction factor.

K. Air Distribution Tests:

1. Air terminal number.
2. Room number/location.
3. Terminal type.
4. Terminal size.
5. Area factor.
6. Design velocity.
7. Design air flow.

8. Test (final) velocity.
9. Test (final) air flow.
10. Percent of design air flow.

L. Sound Level Reports:

1. Location.
2. Octave bands - equipment off.
3. Octave bands - equipment on.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Duct insulation.

B. Duct liner.

C. Jacketing and accessories.

1.2 SECTION DOES NOT INCLUDE

A. Double-walled ducts. See Section 23 31 00 - HVAC Ducts and Casings for all double-walled duct construction, lining, and insulation details.

1.3 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 84 00 - Firestopping.

C. Section 09 91 13 - Exterior Painting: Painting insulation jackets.

D. Section 09 91 23 - Interior Painting: Painting insulation jackets.

E. Section 23 05 53 - Identification for HVAC Piping and Equipment.

1.4 REFERENCE STANDARDS

A. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

B. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus; 2017.

C. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

D. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications; 2013 (Reapproved 2019).

E. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014 (Reapproved 2019).

F. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2023).

G. ASTM C916 - Standard Specification for Adhesives for Duct Thermal Insulation; 2020.

H. ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material); 2019.

I. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts; 2016 (Reapproved 2021).

J. ASTM C1410 - Standard Specification for Cellular Melamine Thermal and Sound-Absorbing Insulation; 2017 (Reapproved 2023).

K. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

L. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

M. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi; 2015, with Editorial Revision (2021).

N. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

O. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

C. Shop Drawings: Provide shop drawings for all listed and labeled systems (e.g., dryer exhaust, combustion air).

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.

B. Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 FIELD CONDITIONS

A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

B. Maintain temperature during and after installation for minimum period of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 GLASS FIBER, FLEXIBLE

A. Insulation: ASTM C553; flexible, noncombustible blanket.

1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent by weight.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

3. Secure with pressure-sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

D. Indoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

E. Outdoor Vapor Barrier Mastic:

1. Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

F. Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

2.3 GLASS FIBER, RIGID

A. Insulation: ASTM C612; rigid, noncombustible.

1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
2. Maximum Service Temperature: 450 degrees F.
3. Maximum Water Vapor Absorption: 5.0 percent.
4. Maximum Density: 8.0 pcf.

B. Vapor Barrier Jacket:

1. Kraft paper with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
3. Secure with pressure-sensitive tape.

C. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.

D. Protective Coating:

1. Manufacturers:
   a. Basis of Design: Design Polymerics; DP 2510 Water Based, Low VOC, Duct Liner Protective Coating: www.designpoly.com.com/.
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

E. Indoor Vapor Barrier Finish:

1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
2. Vinyl emulsion type acrylic, compatible with insulation, black color.

2.4 JACKETING AND ACCESSORIES

A. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.040 inch sheet.

3. Finish: Smooth.
4. Joining: Longitudinal slip joints and 2 inch laps.
5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
7. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

2.5 DUCT LINER

A. Glass Fiber Insulation: Non-corrosive, incombustible glass fiber complying with ASTM C1071; flexible blanket, rigid board, and preformed round liner board; impregnated surface and edges coated with poly vinyl acetate polymer, acrylic polymer, or black composite.

1. Fungal Resistance: No growth when tested according to ASTM G21.
2. Apparent Thermal Conductivity: Maximum of 0.31 at 75 degrees F.
3. Service Temperature: Up to 250 degrees F.
4. Rated Velocity on Coated Air Side for Air Erosion: 5,000 fpm, minimum.
5. Minimum Noise Reduction Coefficients:
   a. 1/2 inch Thickness: 0.30.
   b. 1 inch Thickness: 0.45.
   c. 1-1/2 inches Thickness: 0.60.
   d. 2 inch Thickness: 0.70.

B. Adhesive: Waterproof, fire-retardant type, ASTM C916.

C. Liner Fasteners: Galvanized steel, self-adhesive pad with integral head.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test ductwork for design pressure prior to applying insulation materials.

B. Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Insulated Ducts Conveying Air Below Ambient Temperature:

1. Provide insulation with vapor barrier jackets.
2. Finish with tape and vapor barrier jacket.
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.

C. Insulated Ducts Conveying Air Above Ambient Temperature:

1. Provide with or without standard vapor barrier jacket.
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacketing as specified in JACKETING section above. Rectangular and Oval Ducts shall have

watershed design to prevent ponding on duct surface (flat-surface top installations on exterior are not permitted). See mechanical details on drawings.

E. External Duct Insulation Application:

1. Install according to manufacturer's installation instructions for a watertight installation.

F. Duct and Plenum Liner Application:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Seal and smooth joints. Seal and coat transverse joints.
3. Seal liner surface penetrations with adhesive.

3.3 SCHEDULES

A. Duct Connections to air handling equipment: Provide 1" acoustical lining for at least 10'-0" downstream of the discharge from the air handling unit and 10'-0" upstream of the intake, and at all locations shown or called out on the drawings.

B. Ductwork Inside Building (Concealed):

1. Exhaust Ducts Within 10 ft of Exterior Openings: Insulate to R6 (installed value at 1.5" thickness).
2. Exhaust Ducts: Insulate to R6 (installed value at 1.5" thickness) upstream of energy recovery devices where located outside of building envelope.
3. Outside Air Ducts: Insulate to R6 (installed value at 1.5" thickness) where ambient temperature difference in duct differs more than 10 degrees F from the airstream during any ASHRAE design season.
4. Supply Ducts: Insulate to R6 (installed value at 1.5" thickness).
5. Return Ducts: Do not insulate.
6. Air Transfer Ducts: Provide 2" acoustical lining for entire length of duct for Air Transfer ducts serving sound-sensitive areas (e.g., stages, performance areas, classrooms, etc.), provide no lining for industrial areas, and provide 1" acoustical lining for all other areas.

C. Ducts Exposed to Outdoors (Under Education Center Building):

1. Insulate with 2" elastomeric R8 (installed value at 2" thickness) with Weatherproof Jacket formed. See HVAC / Mechanical drawings for additional details.

D. Ducts Exposed in Mechanical Rooms: Rigid Fiberglass Insulation with Aluminum jacket.

END OF SECTION 23 07 13

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping insulation.

B. Flexible removable and reusable blanket insulation.

C. Jacketing and accessories.

1.2 RELATED REQUIREMENTS

A. Section 01 61 16 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 07 84 00 - Firestopping.

C. Section 09 91 23 - Interior Painting: Painting insulation jacket.

D. Section 23 23 00 - Refrigerant Piping: Placement of inserts.

1.3 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

B. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus; 2019.

C. ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2021a.

D. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form; 2025.

E. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2017, with Editorial Revision (2018).

F. ASTM D1056 - Standard Specification for Flexible Cellular Materials—Sponge or Expanded Rubber; 2020.

G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

H. ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2024a.

I. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.6 FIELD CONDITIONS

A. Maintain ambient conditions required by manufacturers of each product.

B. Maintain temperature before, during, and after installation for minimum of 24 hours.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.2 CELLULAR GLASS

A. Pipe and Tubing Insulation: ASTM C552, Type II, Grade 6.

1. K Value: 0.35 at 100 degrees F.
2. Service Temperature Range: From 250 degrees F to 800 degrees F.
3. Water Vapor Permeability: 0.005 perm inch maximum per inch.
4. Water Absorption: 0.5 percent by volume, maximum.
5. Density: A minimum of 6.12 pcf.

2.3 FLEXIBLE ELASTOMERIC CELLULAR INSULATION

A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum R-Value: R-3
2. Minimum Service Temperature: Minus 40 degrees F.
3. Maximum Service Temperature: 180 degrees F.
4. Connection: Waterproof vapor barrier adhesive.

2.4 JACKETING AND ACCESSORIES

A. PVC Plastic.

1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
   a. Minimum Service Temperature: 0 degrees F.
   b. Maximum Service Temperature: 150 degrees F.
   c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
   d. Connections: Brush on welding adhesive.

B. Aluminum Jacket:

1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
2. Thickness: 0.040 inch sheet.
3. Type: Factory-applied, self-adhesive jacketing.
4. Finish: Embossed.
5. Joining: Longitudinal slip joints and 2 inch laps.
6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C. Stainless Steel Jacket: ASTM A666/A666M, Type 304 stainless steel.

1. Thickness: 0.018 inch.
2. Finish: Smooth.
3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

PART 3 EXECUTION

3.1 EXAMINATION

A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B. Verify that surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Exposed Piping: Locate insulation and cover seams in least visible locations.

C. Insulated Pipes Conveying Fluids Below Ambient Temperature:

1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

D. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions.

E. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with PVC jacket and fitting covers.

F. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum or stainless steel jacket with seams located on bottom side of horizontal piping. Provide two coats of UV resistant finish for flexible elastomeric cellular insulation and cover with aluminum or stainless steel jacket.

3.3 SCHEDULE

A. Cooling Systems:

1. Chilled Water: Interior: Cellular Glass
2. Chilled Water: Outdoors: Cellular Glass with Aluminum or PVC jacketing.
3. Refrigerant Suction: Flexible Elastomeric
4. Refrigerant Hot Gas: Flexible Elastomeric
5. Refrigerant Common Return (3-pipe VRF Systems): Flexible Elastomeric

END OF SECTION 23 07 19

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SECTION 23 21 13 - HYDRONIC PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Hydronic system requirements.

B. Chilled water piping, buried.

C. Chilled water piping, above grade.

D. Pipe hangers and supports.

E. Unions, flanges, mechanical couplings, and dielectric connections.

F. Valves:

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 91 23 - Interior Painting.

D. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping.

E. Section 23 05 23 - General-Duty Valves for HVAC Piping - Hydronic.

F. Section 23 05 48 - Vibration and Seismic Controls for HVAC.

G. Section 23 05 53 - Identification for HVAC Piping and Equipment.

H. Section 23 07 19 - HVAC Piping Insulation.

I. Section 23 21 14 - Hydronic Specialties.

J. Section 23 25 00 - HVAC Water Treatment: Pipe cleaning.

K. Section 25 35 16 - Integrated Automation Sensors and Transmitters: Pipe-mounted product furnishing.

L. Section 25 35 19 - Integrated Automation Control Valves: Product furnishing.

M. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ANSI/FCI 70-2 - Control Valve Seat Leakage; 2021.

B. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.

C. ASME B16.34 - Valves — Flanged, Threaded, and Welding End; 2025.

D. ASME B31.9 - Building Services Piping; 2020.

E. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.

F. ASTM A106/A106M - Standard Specification for Seamless Carbon Steel Pipe for High-Temperature Service; 2019a.

G. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

H. ASTM A183 - Standard Specification for Carbon Steel Track Bolts and Nuts; 2014 (Reapproved 2020).

I. ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2025.

J. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2022.

K. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric); 2020.

L. ASTM D2000 - Standard Classification System for Rubber Products in Automotive Applications; 2018, with Editorial Revision (2024).

M. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2022.

N. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

O. ASTM F1476 - Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2024).

P. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

Q. AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems; 2018.

R. AWWA C606 - Grooved and Shouldered Joints; 2022.

S. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data:

1. Include data on pipe materials, pipe fittings, valves, and accessories.
2. Provide manufacturers catalog information.
3. Indicate valve data and ratings.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section, with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with minimum three years of experience.

C. Provide all grooved joint couplings, fittings, valves, specialties, and grooving tools from a single manufacturer.

D. Date stamp all castings used for coupling housings, fittings, valve bodies, etc. for quality assurance and traceability.

E. Coupling Manufacturer:

1. Perform on-site training by factory-trained representative to the Contractor's field personnel in the proper use of grooving tools and installation of grooved joint products.
2. Periodic job site visits by factory-trained representative to ensure best practices in grooved joint installation.
3. A distributor's representative is not considered qualified to perform the training.

F. Welder Qualifications: Certify in accordance with ASME BPVC-IX.

1. Provide certificate of compliance from authority having jurisdiction, indicating approval of welders.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary protective coating on cast iron and steel valves.

C. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

D. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 HYDRONIC SYSTEM REQUIREMENTS

A. Comply with ASME B31.9 and applicable federal, state, and local regulations.

B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:

1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
3. Grooved mechanical joints may be used in accessible locations only.
    a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Contracting Officer.
    b. Grooved mechanical connections and joints comply with AWWA C606.
    c. Use rigid joints unless otherwise indicated.
    d. Use flexible connectors at all equipment connections, where required by codes, listed standards, or the AHJ, and where indicated on drawings..
4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.

C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.

D. Valves: Provide valves where indicated:

1. Provide drain valves where indicated, and if not indicated, provide at least at main shut-off, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch gate valves with cap; pipe to nearest floor drain.

2. Isolate equipment using butterfly valves with lug end flanges or grooved mechanical couplings.
3. For throttling, bypass, or manual flow control services, use butterfly valves.
4. For throttling and isolation service in chilled and condenser water systems, use only butterfly valves.
5. For shut-off and to isolate parts of systems or vertical risers, use gate, ball, or butterfly valves.

E. Welding Materials and Procedures: Comply with ASME BPVC-IX.

2.2 CHILLED WATER PIPING, BURIED

A. Pre-Engineered Cased Piping System

B. Carrier Pipe: PVC, SDR-26, Class 160.

C. Insulation: Polyurethane foam, 2" thickness, injected into the annular space.

D. Casing: HPDE, minimum wall thickness of 100 mils.

2.3 CHILLED WATER PIPING, ABOVE GRADE

A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:

1. Grooved Joints: AWWA C606 grooved tube, fittings of same material, and copper-tube-dimension mechanical couplings.
2. Tee Connections: Mechanically extracted collars with notched and dimpled branch tube.

2.4 PIPE HANGERS AND SUPPORTS

A. Provide hangers and supports that comply with MSS SP-58.

1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
2. See section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment for hangar specifications.

B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.5 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

A. Unions for Pipe of 2 Inches and Less:

B. Flanges for Pipe 2 Inches and Greater:

C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.

1. Dimensions and Testing: In accordance with AWWA C606.
2. Mechanical Couplings: Comply with ASTM F1476.
3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

D. Dielectric Connections:

1. Flanges:
    a. Dielectric flanges with same pressure ratings as standard flanges.
    b. Water impervious insulation barrier capable of limiting galvanic current to 1 percent of short circuit current in a corresponding bimetallic joint.
    c. Dry insulation barrier able to withstand 600-volt breakdown test.
    d. Construct of galvanized steel with threaded end connections to match connecting piping.
    e. Suitable for the required operating pressures and temperatures.
2. Unions:
    a. 1/2 to 1 Inches: Brass solder to galvanized FPT.
    b. 1/2 to 2 Inches: Brass solder to galvanized FPT.
    c. 1/2 to 1 Inches: Brass to galvanized FPT or FIP (Female Iron Pipe).
    d. 3/4 to 1/2 Inch Reducer: Brass solder to galvanized FPT.
    e. Service: 250 psi, minus 20 to 180 deg F.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.

C. Remove scale and dirt on inside and outside before assembly.

D. Prepare piping connections to equipment using jointing system specified.

E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

F. After completion, fill, clean, and treat systems. See Section 23 25 00 for additional requirements.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install heating water, glycol, chilled water, condenser water, and engine exhaust piping to ASME B31.9 requirements.

C. PP-RCT Pipe: Make heat fusion joint per manufacturers instructions.

D. Route piping in orderly manner, parallel to building structure, and maintain gradient.

E. Install piping to conserve building space and to avoid interference with use of space.

F. Group piping whenever practical at common elevations.

G. Sleeve pipe passing through partitions, walls, and floors.

H. Slope piping and arrange to drain at low points.

I. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. See Section 23 05 16.

J. Grooved Joints:

1. Install in accordance with the manufacturer's latest published installation instructions.

2. Gaskets to be suitable for the intended service, molded, and produced by the coupling manufacturer.

K. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.9, ASTM F708, or MSS SP-58.
2. Support horizontal piping as scheduled.
3. Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inches minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Provide copper plated hangers and supports for copper piping.
9. Prime coat exposed steel hangers and supports. See Section 09 9123. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

L. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. See Section 23 07 19.

M. Provide access where valves and fittings are not exposed.

N. Use eccentric reducers to maintain top of pipe level.

O. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welds.

P. Prepare unfinished pipe, fittings, supports, and accessories, ready for finish painting. See Section 09 91 23.

Q. Install valves with stems upright or horizontal, not inverted.

R. See Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment for piping hanger schedules and installation instructions.

END OF SECTION 23 21 13

SECTION 23 21 14 - HYDRONIC SPECIALTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Expansion tanks.

B. Air vents.

C. Air separators.

D. Strainers.

E. Pressure-temperature test plugs.

F. Relief valves.

1.2 RELATED REQUIREMENTS

A. Section 22 10 06 - Plumbing Piping Specialties: Backflow preventers.

B. Section 23 21 13 - Hydronic Piping.

C. Section 23 25 00 - HVAC Water Treatment: Pipe cleaning.

1.3 REFERENCE STANDARDS

A. ASME B16.1 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.

B. ASME B16.5 - Pipe Flanges and Flanged Fittings: NPS 1/2 Through NPS 24 Metric/Inch Standard; 2025.

C. ASME B16.11 - Forged Fittings, Socket-welding and Threaded; 2016 (Errata 2017).

D. ASME BPVC-VIII-1 - Boiler and Pressure Vessel Code, Section VIII, Division 1: Rules for Construction of Pressure Vessels; 2025, with Errata .

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide product data for manufactured products and assemblies required for this project. Include component sizes, rough-in requirements, service sizes, and finishes. Include product description and model.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Accept valves on site in shipping containers with labeling in place. Inspect for damage.

B. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.

C. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 EXPANSION TANKS

A. Construction: Welded steel, tested and stamped in accordance with ASME BPVC-VIII-1; supplied with National Board Form U-1, rated for working pressure of 125 psi, with flexible EPDM diaphragm or bladder sealed into tank, and steel support stand.

B. Accessories: Pressure gauge and air-charging fitting, tank drain; pre-charge to 12 psi.

C. Automatic Cold Water Fill Assembly: Pressure reducing valve, reduced pressure double check backflow preventer, test cocks, strainer, vacuum breaker, and valved by-pass.

2.2 AIR VENTS

A. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.

B. Float Type:

1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.

C. Washer Type:

1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring-loaded ball check valve.

2.3 AIR SEPARATORS

A. In-line Air Separators:

1. Cast iron for sizes 1-1/2 inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure.

B. Centrifugal Air Separators/Strainers:

1. Steel, tested and stamped in accordance with ASME BPVC-VIII-1; for 125 psi operating pressure, with integral bronze strainer, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.4 STRAINERS

A. Size 2 inch and Under:

1. Screwed brass or iron body for 175 psi working pressure, Y pattern with 1/32 inch stainless steel perforated screen.

B. Size 2-1/2 inch to 4 inch:

1. Provide flanged or grooved iron body for 175 psi working pressure, Y pattern with 1/16 inch stainless steel perforated screen.

C. Size 5 inch and Larger:

1. Provide flanged or grooved iron body for 175 psi working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.5 PRESSURE-TEMPERATURE TEST PLUGS

A. Construction: Brass body designed to receive temperature or pressure probe with removable protective cap, and Neoprene rated for minimum 200 degrees F.

B. Application: Use extended length plugs to clear insulated piping.

2.6 RELIEF VALVES

A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

B. Where large air quantities can accumulate, provide enlarged air collection standpipes.

C. Provide manual air vents at system high points and as indicated.

D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.

E. Provide air separator on suction side of system circulation pump and connect to expansion tank.

F. Provide valved drain and hose connection on strainer blowdown connection.

G. Support pump fittings with floor-mounted pipe and flange supports.

H. Provide relief valves on pressure tanks, low-pressure side of reducing valves, heat exchangers, and expansion tanks.

I. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.

J. Pipe relief valve outlet to nearest floor drain.

K. Where one line vents several relief valves, make cross-sectional area equal to sum of individual vent areas.

END OF SECTION 23 21 14

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SECTION 23 23 00 - REFRIGERANT PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Piping.

B. Refrigerant.

C. Moisture and liquid indicators.

D. Valves.

E. Strainers.

F. Filter-driers.

G. Solenoid valves.

H. Flexible connections.

I. Engineered wall seals and insulation protection.

J. Engineered roof penetration protection.

K. Exterior penetration accessories.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 08 31 00 - Access Doors and Panels.

C. Section 09 91 23 - Interior Painting.

D. Section 23 07 19 - HVAC Piping Insulation: Refrigerant Piping Insulation Requirements

E. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AHRI 760 (I-P) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

B. AHRI 761 (SI) - Performance Rating of Solenoid Valves for Use with Volatile Refrigerants; 2014.

C. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Errata (2025).

D. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).

E. ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2025.

F. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.

G. ASME B16.26 - Cast Copper Alloy Fittings for Flared Copper Tubes; 2024.

H. ASME B31.5 - Refrigeration Piping and Heat Transfer Components; 2022.

I. ASME B31.9 - Building Services Piping; 2020.

J. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

K. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service; 2023.

L. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers; 2024.

M. AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding; 2019.

N. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).

O. ICC (IMC)-2018 - International Mechanical Code; 2018.

P. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation; 2018.

Q. UL 207 - Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

R. UL 429 - Electrically Operated Valves; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of documented experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store piping and specialties in shipping containers with labeling in place.

B. Protect piping and specialties from entry of contaminating material by **leaving end caps and plugs in place until installation. The use of adhesive tape to cap piping is PROHIBITED, and use of this or other similar methods that do not use plugs or end caps specifically designed for pipe capping duty shall constitute grounds for requiring cleaning of all piping connected to the improperly capped pipe or joint at Contractor's expense.**

C. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure integrity of system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

B. Provide pipe hangers and supports in accordance with ASME B31.5 unless indicated otherwise.

C. Liquid Indicators:

1. Use line size liquid indicators in main liquid line leaving condenser.

2. If receiver is provided, install in liquid line leaving receiver.
3. Use line size on leaving side of liquid solenoid valves.

D. Valves:

1. Use service valves on suction and discharge of compressors.
2. Use gauge taps at compressor inlet and outlet.
3. Use gauge taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.
5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging (Packed Angle) Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.
2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
3. On steel piping systems, use strainer in suction line.
4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Filter-Driers:

1. Use a filter-drier immediately ahead of liquid-line controls, such as thermostatic expansion valves, solenoid valves, and moisture indicators.
2. Use a filter-drier on suction line just ahead of compressor.
3. Use sealed filter-driers in lines smaller than 1/2 inch outside diameter.
4. Use sealed filter-driers in systems utilizing hermetic compressors.
5. Use replaceable core filter-driers in lines of 1/2 inch outside diameter or greater.
6. Use replaceable core liquid-line filter-driers in systems utilizing receivers.
7. Use filter-driers for each solenoid valve.

I. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

J. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

2.2 REGULATORY REQUIREMENTS

A. Comply with ASME B31.9 for installation of piping system.

B. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.

C. Welders Certification: In accordance with ASME BPVC-IX.

2.3 PIPING

A. Copper Tube: ASTM B280, H58 hard drawn.

1. Fittings: ASME B16.22 wrought copper.
2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

B. Pipe Supports and Anchors:

1. Provide hangers and supports that comply with MSS SP-58. See Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment for additional requirements.
2. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
   a. Bases: High density, UV tolerant, polypropylene or reinforced PVC.
   b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
   c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
   d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
   e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
   f. Manufacturers:
      1) Basis of Design: PHP Systems/Design: www.phpsd.com/.
      2) Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.4 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

2.5 VALVES

A. Ball Valves:

1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.

B. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

2.6 STRAINERS

A. Straight Line or Angle Line Type:

1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

2.7 FILTER-DRIERS

A. Cores: Molded or loose-fill molecular sieve desiccant compatible with refrigerant, activated alumina, activated charcoal, and filtration to 40 microns, with secondary filtration to 20 microns; of construction that will not pass into refrigerant lines.

B. Construction: UL listed.

1. Replaceable Core Type: Steel shell with removable cap.
2. Sealed Type: Copper shell.
3. Connections: As specified for applicable pipe type.

2.8 SOLENOID VALVES

A. Valve: AHRI 760 (I-P), pilot operated, copper, brass or steel body and internal parts, synthetic seat, stainless steel stem and plunger assembly (permitting manual operation in case of coil failure), integral strainer, with flared, soldered, or threaded ends; for maximum working pressure of 500 psi.

B. Coil Assembly: UL 429 UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box with pilot light.

2.9 FLEXIBLE CONNECTORS

A. Corrugated stainless steel hose with single layer of stainless steel exterior braiding and dielectric connection fittings compatible with refrigerant type or listed and rated for use with other materials in system, minimum 9 inches long with copper tube ends; for maximum working pressure of 500 psi.

2.10 ENGINEERED WALL SEALS AND INSULATION PROTECTION

A. Insulation Protection System: Mechanical line insulation and PVC cover.

1. PVC Insulation Cover Color: Black with full-length velcro fastener.

2.11 EXTERIOR PENETRATION ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

B. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

PART 3 EXECUTION

3.1 PREPARATION

A. Ream pipe and tube ends. Remove burrs. Bevel plain-end ferrous pipe.

B. Remove scale and dirt on inside and outside before assembly.

C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

A. Install refrigeration systems and specialties in accordance with manufacturer's instructions. Where these specifications and the manufacturer's instructions differ, use the more stringent method, except where doing so would negatively affect system operation.

B. **BRAZING ACTIVITIES: Flood refrigerant piping systems with nitrogen <u>for the duration of all brazing activities.</u>** Cut sample joints selected by the Engineer and/or the Contracting Officer of Record to inspect for carbon buildup or improper brazing techniques. **Piping found to have excessive scale or carbon buildup due to neglecting nitrogen purge must be replaced in its entirety.** Provide sample cuts for not less than three (3) locations, and not more than 2% of the fittings in the system, as directed.

1. **Mechanical Press-Sealed Fittings installed in accordance with the manufacturer's instructions are exempt from this requirement.** Only brazed/welded piping and fittings require sample cuts.

C. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.

D. Install piping to conserve building space and avoid interference with use of space.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Inserts:

1. Provide inserts for placement in concrete formwork.
2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.

G. Pipe Hangers and Supports:

1. Install in accordance with ASME B31.5.
2. Support horizontal piping as indicated.
3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
6. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
7. Provide copper plated hangers and supports for copper piping.

H. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.

I. Provide clearance for installation of insulation and access to valves and fittings.

J. Provide access to concealed valves and fittings.

K. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.

L. Prepare unfinished pipe, fittings, supports, and accessories for finish painting. See Section 09 91 23.

M. Follow ASHRAE Std 15 procedures for charging and purging of systems and for disposal of refrigerant.

N. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.

O. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.

P. Fully charge completed system with refrigerant after testing.

Q. Provide electrical connection to solenoid valves. See Section 26 05 83.

3.3 SYSTEM PRESSURE TEST

A. Provide system pressure testing in accordance with manufacturer's instructions. Pressure test shall be documented and shall be both witnessed and approved by the manufacturer's representative in writing. **For all tests, guages must read the same pressure both before and after the time periods indicated unless equipment manufacturer specifically directs otherwise.** The pressure tests shall include the following, at a minimum:

1. Pressurization Procedure:
    a. Step 1: 150 psi dry nitrogen held for 3 minutes. Two (2) time stamps: Start and Finish.
    b. Step 2: 325 psi dry nitrogen held for 5 minutes. Two (2) time stamps: Start and Finish.
    c. Step 3: 550 psi dry nitrogen held for 24 hours. Two (2) time stamps: Start and Finish.
2. Evacuation Procedure:
    a. Step 1: Evacuate to 4,000 microns and wait 30 seconds; if measured pressure remains at or below 4,000 microns, hold for 15 minutes - else restart vacuum pump and bring below 4,000 microns and repeat 30 second wait. Break vacuum with dry nitrogen at 2-3 psig. Three (3) time stamps: Start and Finish, and Positive Pressure.
    b. Step 2: Evacuate to 1,500 microns and wait 30 seconds; if measured pressure remains at or below 1,500 microns, hold for 15 minutes - else restart vacuum pump and bring below 1,500 microns and repeat 30 second wait. Three (3) time stamps: Start and Finish, and Positive Pressure.
    c. Step 3: Evacuate to 475 microns and wait 30 seconds; if measured pressure remains at or below 475 microns, hold for 60 minutes - else restart vacuum pump and bring below 475 microns and repeat 30 second wait. Two (2) time stamps: Start and Finish.
    d. If vacuum level remains below 500 microns after the 60 minute period, system is ready for charging.

B. Documentation:

1. Documentation of pressure test shall include the following, at a minimum:
    a. Time stamps recording the beginning and end of each pressure test

b. The total time length of each test in hours, minutes, and seconds
c. Recorded pressures at beginning and end of each pressure test
d. Photographs of the gauge readings at each time stamp.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Test refrigeration system in accordance with ASME B31.5, and in accordance with manufacturer's instructions.

3.5 SCHEDULES

A. Hanger Spacing for Copper Tubing.

1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

END OF SECTION 23 23 00

SECTION 23 25 00 - HVAC WATER TREATMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Materials.

1. System cleaner.
2. Closed system treatment (water).

B. By-pass (pot) feeder.

1.2 RELATED REQUIREMENTS

A. Section 23 09 13 - Instrumentation and Control Devices for HVAC.

B. Section 23 21 13 - Hydronic Piping.

C. Section 23 21 14 - Hydronic Specialties.

D. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. FM (AG) - FM Approval Guide; Current Edition.

B. ITS (DIR) - Directory of Listed Products; Current Edition.

C. UL (DIR) - Online Certifications Directory; Current Edition.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience. Company shall have local representatives with water analysis laboratories and full time service personnel.

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience and approved by manufacturer.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

A. Comply with applicable codes for addition of non-potable chemicals to building mechanical systems and to public sewage systems.

B. Comply with UL (DIR) requirements.

C. Perform work in accordance with local health department regulations.

D. Provide certificate of compliance from Authority Having Jurisdiction indicating approval of installation.

2.2 MATERIALS

A. System Cleaner:

1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products; sodiumtripoly phosphate and sodium molybdate.
2. Biocide chlorine release agents such as sodium hypochlorite or calcium hypochlorite or microbiocides such as quarternary ammonia compounds, tributyltin oxide, methylene bis (thiocyanate).

B. Closed System Treatment (Water):

1. Sequestering agent to reduce deposits and adjust pH; polyphosphate.
2. Corrosion inhibitors; boron-nitrite, sodium nitrite and borax, sodium totyltriazole, low molecular weight polymers, phosphonates, sodium molybdate, or sulphites.
3. Conductivity enhancers; phosphates or phosphonates.

2.3 BY-PASS (POT) FEEDER

A. 1.8 gal quick opening cap for working pressure rated at minimum 175 psi and 450°F.

PART 3 EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.

B. Place terminal control valves in open position during cleaning.

C. Verify that electric power is available and of the correct characteristics.

3.2 CLEANING SEQUENCE

A. Concentration:

1. As recommended by manufacturer.

B. Chilled Water Systems:

1. Circulate for 48 hours, then drain systems as quickly as possible.
2. Refill with clean water, circulate for 24 hours, then drain.
3. Refill with clean water and repeat until system cleaner is removed.

C. Use neutralizer agents on recommendation of system cleaner supplier and approval of Contracting Officer.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 CLOSED SYSTEM TREATMENT

A. Provide one bypass feeder on each system. Install isolating and drain valves and necessary piping. Install around balancing valve downstream of circulating pumps unless indicated otherwise.

B. Introduce closed system treatment through bypass feeder when required or indicated by test.

C. Provide 3/4 inch water coupon rack around circulating pumps with space for 4 test specimens.

3.5 CLOSEOUT ACTIVITIES

A. Training: Train Government's personnel on operation and maintenance of chemical treatment system.

1. Provide minimum of two hours of instruction for two people.
2. Have operation and maintenance data prepared and available for review during training.
3. Conduct training using actual equipment after treated system has been put into full operation.

3.6 MAINTENANCE

A. Perform maintenance work using competent and qualified personnel under the supervision and in the direct employ of the equipment manufacturer or original installer.

B. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of Government.

C. Provide service and maintenance of treatment systems for one year from Date of Substantial Completion.

D. Provide monthly technical service visits to perform field inspections and make water analysis on-site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

E. Provide laboratory and technical assistance services during this maintenance period.

F. Provide on-site inspections of equipment during scheduled or emergency shutdown to properly evaluate success of water treatment program, and make recommendations in writing based upon these inspections.

END OF SECTION 23 25 00

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SECTION 23 31 00 - HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal ducts.

B. Flexible ducts.

C. Nonmetal ducts.

D. Ducts for kitchen exhaust applications.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 09 91 13 - Exterior Painting: Weld priming, weather resistant, paint or coating.

C. Section 09 91 23 - Interior Painting: Weld priming, paint or coating.

D. Section 11 40 00 - Foodservice Equipment: Kitchen range hoods.

E. Section 23 01 30.51 - HVAC Air-Distribution System Cleaning: Post install duct cleaning.

F. Section 23 07 13 - Duct Insulation: External insulation and duct liner.

G. Section 23 33 00 - Air Duct Accessories.

H. Section 23 37 00 - Air Outlets and Inlets: Fabric air distribution devices.

1.3 REFERENCE STANDARDS

A. ASHRAE (FUND) - ASHRAE Handbook - Fundamentals; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASHRAE Std 126 - Method of Testing HVAC Air Ducts; 2020.

C. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.

E. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

F. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2024.

G. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2023.

H. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

I. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements; 2009 (Reapproved 2016).

J. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2020.

K. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems; 2024.

L. ASTM E2336 - Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems; 2020.

M. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2018, with Editorial Revision (2020).

N. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry; 2018, with Editorial Revision (2020).

O. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2017, with Editorial Revision (2020).

P. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2023.

Q. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

R. NFPA 90B - Standard for the Installation of Warm Air Heating and Air-Conditioning Systems; 2024.

S. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

T. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

U. SMACNA (FGD) - Fibrous Glass Duct Construction Standards; 2021.

V. SMACNA (KVS) - Kitchen Ventilation Systems and Food Service Equipment Fabrication and Installation Guidelines; 2001.

W. SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual; 2012.

X. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

Y. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

Z. UL 1479 - Standard for Fire Tests of Penetration Firestops; Current Edition, Including All Revisions.

AA. UL 1978 - Grease Ducts; Current Edition, Including All Revisions.

BB. UL 2221 - Tests of Fire Resistive Grease Duct Enclosure Assemblies; Current Edition, Including All Revisions.

CC. UL 2518 - Standard for Safety Air Dispersion Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data for duct materials.

C. Shop Drawings: Indicate duct fittings, particulars such as gauges, sizes, welds, and configuration prior to start of work for medium pressure class and higher systems.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer. See Government

B. Installer Qualifications: Company specializing in performing the type of work specified in this section, with minimum three years of documented experience.

1.6 FIELD CONDITIONS

A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.

B. Maintain temperatures within acceptable range during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.

B. Provide metal duct unless otherwise indicated.

C. Duct Shape and Material in accordance with Allowed Static Pressure Range:

1. Round: Plus or minus 2 in-wc of galvanized steel.
2. Rectangular: Plus or minus 2 in-wc of galvanized steel.
3. Flat Oval: Plus 2 in-wc of galvanized steel.
4. Flexible Duct (Fabric and wire): Plus or minus 1/2 in-wc; see Section 23 37 00.

D. Duct Sealing and Leakage in accordance with Static Pressure Class:

1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
   a. Low pressure ductwork: 1/2 in-wc pressure class, galvanized steel.
   b. Outside Air Intake and Supply: 3 in-wc pressure class, galvanized steel.
   c. Return and Relief Air: 1/2 in-wc pressure class, galvanized steel.
   d. Transfer-air and Sound Boots: 1/2 in-wc pressure class, fibrous glass.
2. Low Pressure Service: Up to 3 in-wc:
   a. Seal: Class B, apply sealing of transverse joints and longitudinal seams.
   b. Leakage:
      1) Rectangular: Class 12 or 12 cfm/100 sq ft.
      2) Round: Class 6 or 6 cfm/100 sq ft.

E. Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
2. Variation of duct configuration or size must be reflected in the shop drawings. Size round duct installed in place of rectangular ducts in accordance with ASHRAE (FUND) Handbook - Fundamentals.

3. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
4. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
5. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
6. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
7. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
8. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide duct transitions sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.2 METAL DUCTS

A. Material Requirements:

1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.

B. Round Metal Ducts:

1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
2. Round Connection System: Interlocking duct connection system in accordance with SMACNA (DCS).

C. Round Spiral Duct:

1. Round spiral lock seam duct with galvanized steel outer wall.

D. Connectors, Fittings, Sealants, and Miscellaneous:

1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
   a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
   b. VOC Content: Not more than 250 g/L, excluding water.
   c. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
   d. For Use with Flexible Ducts: UL labeled.
4. Gasket Tape:
   a. Provide butyl rubber gasket tape for a flexible seal between transfer duct connector (TDC), transverse duct flange (TDF), applied flange connections, and angle ring connections.

5. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.
6. Hanger Fasteners: Attach hangers to structure using appropriate fasteners as follows:
   a. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
   b. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
   c. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

2.3 FLEXIBLE DUCTS

A. Flexible Air Ducts:

1. UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound spring steel wire.
2. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
3. Pressure Rating: From 10 in-wc to 1 in-wc negative.
4. Maximum Velocity: 4,000 fpm.
5. Temperature Range: Minus 20 to 210 degrees F.

2.4 NON-METAL DUCTS

A. Air Dispersion (Sock) Ducts:

1. 1/4 to 3.1 in-wc static, with hangers, supports and appurtenances as listed per UL 2518. See drawings for type configuration.
2. Manufacturers:
   a. Basis of Design: DuctSox Corporation: www.ductsox.com/
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.5 DUCTS FOR KITCHEN EXHAUST APPLICATIONS

A. Provide ductwork, fittings, and appurtenances certified to NFPA 96, SMACNA (KVS), UL 1978, and UL 2221 requirements and guidelines.

B. Class 1 duct for air with gas and grease particle exhaust at an air velocity of 1,500 to 2,500 fpm.

C. Where ducts are not self-draining back to equipment, provide low-point drain pocket with the copper drain pipe to a sanitary sewer.

D. Design, fabricate, and install liquidtight preventing exhaust leakage into building.

E. Dishwasher Exhaust Duct:

1. Duct Size: 1/2 in-wc pressure class stainless steel or aluminum.
2. Fabricate using single wall, 16-gauge, 0.059-inch sheet steel with continuous external welded joints to form rectangular sections.
3. Seal joints during installation with factory-supplied overlapping V-bands and sealant.

F. Kitchen Hood and Grease Exhaust Duct:

1. Fabricate in accordance with ductwork manufacturer's instructions, SMACNA (DCS), SMACNA (KVS), and NFPA 96.
2. Zero Clearance, 2-Hour Fire-Rated, Round, Double-Wall, Premanufactured Grease Duct:
   a. UL Listed and labeled to UL 1978 and UL 2221.

b. Nominal 3 inches thick, high density body soluble fiber insulation between 20-gauge, 0.035-inch Type 304 stainless steel liner, and 24-gauge, 0.0239-inch aluminized steel sheet outer jacket.
c. Seal joints during installation with factory-supplied overlapping V-bands and sealant.
d. Through-penetration firestop listed to UL 1479 or ASTM E814.
e. Minimum horizontal slope of 1/16 inch per foot per manufacturers listing to UL 1978.

3. Zero Clearance, 2-Hour Fire-Rated, Rectangular, Double-Wall, Premanufactured Grease Duct:
   a. Listed when tested in accordance with UL 1978 and ASTM E2336.
   b. Construct of 16-gauge, 0.059-inch sheet steel using continuous external welded joints in rectangular sections.
   c. Construct of 18-gauge, 0.050-inch stainless steel using continuous external welded joints in rectangular sections.
   d. Liquidtight with continuous external weld for seams and joints.
   e. Where ducts are not self-draining back to equipment, provide low-point drain pocket with copper drain pipe to sanitary sewer.
   f. Through-penetration firestop listed to UL 1479 or ASTM E814.
4. Grease Exhaust Duct Access Doors:
   a. Listed when tested in accordance with UL 1978.
   b. Install hinged access doors where indicated or required for access for cleaning and inspection of duct.
   c. Reinforce door frames with steel angles tied to horizontal and vertical plenum supporting angles.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install, support, and seal ducts in accordance with SMACNA (DCS).

B. Install products following the manufacturer's instructions.

C. Comply with safety standards NFPA 90A and NFPA 90B.

D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.

E. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.

F. Flexible Ducts: Connect to metal ducts with adhesive, draw bands, and foil tape.

G. Kitchen Range Hoods: Install when provided by Section 11 40 00 then fit-out with respective ductwork and accessories to interconnect exhaust system.

H. Kitchen Hood Exhaust: Provide residue traps at the base of vertical risers with provisions for the cleanout.

I. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.

J. Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.

K. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

L. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with a crimp in the direction of airflow.

M. Use double nuts and lock washers on threaded rod supports.

N. Connect terminal units to supply ducts directly or with one foot maximum length of flexible neoprene glass fabric duct. Do not use flexible duct to change direction.

O. Connect diffusers to low pressure ducts directly or with 5 feet maximum length of flexible duct held in place with strap or clamp.

P. Fire Partitions: Provide firestopping sealing. See Section 07 84 00.

Q. Duct Insulation: Provide duct insulation. See Section 23 07 13.

R. Painting: Provide surface finish as indicated on drawings. See Sections 09 91 13 and 09 91 23.

3.2 CLEANING

A. Clean thoroughly each existing duct system within the scope indicated to be reused on the drawings. See Section 23 01 30.51 - HVAC Air-Distribution System Cleaning.

B. Clean new duct systems by forcing air at high velocity through duct to remove accumulated dust. Clean half the system at a time to obtain sufficient air. Protect equipment that could be harmed by excessive dirt with temporary filters or bypass during cleaning.

END OF SECTION 23 31 00

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SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air turning devices/extractors.

B. Backdraft dampers - metal.

C. Backdraft dampers - fabric.

D. Combination fire and smoke dampers.

E. Duct access doors.

F. Duct test holes.

G. Fire dampers.

H. Flexible duct connectors.

I. Volume control dampers.

J. Low leakage (Class 1A) control dampers.

K. Miscellaneous Products:

1. Internal strut end plugs.
2. Duct opening closure film.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 23 31 00 - HVAC Ducts and Casings.

C. Section 25 35 13 - Integrated Automation Actuators and Operators: Damper operators.

D. Section 25 35 16 - Integrated Automation Sensors and Transmitters: Damper position switch.

E. Section 25 35 23 - Integrated Automation Control Dampers: Product furnishing.

F. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. AMCA 500-D - Laboratory Methods of Testing Dampers for Rating; 2018.

B. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

C. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

D. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2024.

E. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

F. UL 33 - Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.

G. UL 94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances; Current Edition, Including All Revisions.

H. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

I. UL 555 - Standard for Fire Dampers; Current Edition, Including All Revisions.

J. UL 2043 - Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide for shop fabricated assemblies including volume control dampers . Include electrical characteristics and connection requirements.

C. Project Record Drawings: Record actual locations of access doors and test holes.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect dampers from damage to operating linkages and blades.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 BACKDRAFT DAMPERS - METAL

A. Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: Galvanized steel, with center pivoted blades of maximum 6 inch width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device with gravity counterbalance to permit setting for varying differential static pressure.

2.3 BACKDRAFT DAMPERS - FABRIC

A. Fabric Backdraft Dampers: Factory-fabricated.

1. Blades: Neoprene coated fabric material.
2. Birdscreen: 1/2 inch nominal mesh of galvanized steel or aluminum.
3. Maximum Velocity: 1000 fpm (5 mps) face velocity.

2.4 DUCT ACCESS DOORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.5 DUCT TEST HOLES

A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 FIRE DAMPERS

A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.

B. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.

C. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for 1-inch pressure-class ducts up to 12 inches in height.

D. Fusible Links: UL 33, separate at 160 degrees F with adjustable link straps for combination fire/balancing dampers.

2.7 FLEXIBLE DUCT CONNECTORS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Flexible Duct Connections: Fabric crimped into metal edging strip.

1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd.
   a. Net Fabric Width: Approximately 2 inches wide.
   b. Metal: 3 inches wide, metal thickness and type to match connecting duct material.

C. Maximum Installed Length: 14 inch.

2.8 VOLUME CONTROL DAMPERS

A. Fabricate in accordance with SMACNA (DCS) and as indicated.

B. Splitter Dampers:

1. Material: Same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
2. Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
3. Operator: Minimum 1/4 inch diameter rod in self aligning, universal joint action, flanged bushing with set screw.

C. Single Blade Dampers:

1. Fabricate for duct sizes up to 6 by 30 inch.
2. Blade: 24 gauge, 0.0239 inch, minimum.

D. Multi-Blade Damper: Fabricate consisting of opposed blades with maximum blade sizes 8 by 72 inches. Assemble center- and edge-crimped blades in prime-coated or galvanized-channel frame with suitable hardware.

1. Blade: 18 gauge, 0.0478 inch, minimum.

E. End Bearings: Except in round ducts 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon, thermoplastic elastomer, or sintered bronze bearings.

1. Manufacturers:

a. Basis of Design: Carlisle HVAC Products; Dynair End Bearing Leak Resistant Sets: www.carlislehvac.com/
b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

F. Quadrants:

1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
3. Where rod lengths exceed 30 inches provide regulator at both ends.
4. Manufacturers:
   a. Basis of Design: Carlisle HVAC Products; Dynair Double Shear Rattle Free Quadrants 1/2 inch: www.carlislehvac.com
   b. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for "Equal" product substitution procedures.

2.9 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

A. Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc.

B. Frame:

1. Material: 20-gauge galvanized steel.
2. Free-area: Single cross section.
3. Blanked-off: Split frame into two free-area sections to allow a smaller free-area to be used for a minimum airflow intake or exhaust application and secondary free-area fully blanked-off.

C. Blade:

1. Type: Single-blade rectangle shape.
2. Operation: Opposed type.
3. Maximum Individual Blade Height: 8 inches.
4. Material: 12-gauge galvanized steel.
5. Authority: Opposed type, 5 to 50 percent (typically 10 percent).

D. Insulation: Water-resistant sound absorbing material.

E. Temperature Service Range: Minus 25 to 185 degrees F.

2.10 MISCELLANEOUS PRODUCTS

A. Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.

B. Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.

1. Thickness: 2 mils.
2. High tack water based adhesive.

3. UV stable light blue color.
4. Elongation Before Break: 325 percent, minimum.

PART 3 EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 23 31 00 for duct construction and pressure class.

B. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch size access door for balancing dampers only. Review locations prior to fabrication.

D. Provide duct test holes where indicated and required for testing and balancing purposes.

E. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.

F. Demonstrate re-setting of fire dampers to Government's representative.

G. At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.

H. At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.

I. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum two duct widths from duct take-off.

J. Do not use splitter dampers unless specifically indicated on drawings.

K. Provide balancing dampers on duct take-offs to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly or shown on the drawings.

END OF SECTION 23 33 00

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SECTION 23 34 16 - CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Backward inclined centrifugal fans.

B. Airfoil wheel centrifugal fans.

C. Bearings and drives.

D. Accessories.

1.2 RELATED REQUIREMENTS

A. Section 23 05 13 - Common Motor Requirements for HVAC Equipment.

B. Section 23 33 00 - Air Duct Accessories: Backdraft dampers.

C. Section 26 05 83 - Wiring Connections: Electrical characteristics and wiring connections.

1.3 REFERENCE STANDARDS

A. ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings; 2015.

B. ABMA STD 11 - Load Ratings and Fatigue Life for Roller Bearings; 2014 (Reaffirmed 2020).

C. AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.

D. AMCA 99 - Standards Handbook; 2025.

E. AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2025.

F. AMCA 300 - Reverberation Room Methods of Sound Testing of Fans; 2024.

G. AMCA 301 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data; 2022.

H. NEMA MG 00001 - Motors and Generators; 2024.

I. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

B. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect motors, shafts, and bearings from weather and construction dust.

1.7 FIELD CONDITIONS

A. Permanent fans may not be used for ventilation during construction.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.

C. Fabrication: Comply with AMCA 99.

D. Performance Base: Project-Specific elevation conditions.

2.2 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and backplate; cast iron hub riveted to back plate and keyed to shaft with set screws.

B. Airfoil Wheel: Steel construction with smooth curved inlet flange, heavy backplate die-formed hollow airfoil shaped blades continuously welded at tip flange, and backplate; cast iron or cast steel hub riveted to backplate and keyed to shaft with set screws.

2.3 HOUSING

A. Heavy gauge steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut.

2.4 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

B. Drives: As specified in the fan schedule drawings. If no drive is specified, provide Variable Frequency Drive (VFD) or Electronically-Commutated Motor (ECM) to effectuate speed control for the fan motor. **Do not use belt drives unless specifically called out on the drawings.**

2.5 ACCESSORIES

A. Inlet/Outlet Screens: Galvanized steel welded grid.

B. Access Doors: Shaped to fit scroll, with quick opening latches and gaskets.

C. Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install flexible connections between fan inlet and discharge ductwork; see Section 23 33 00. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.

C. Provide backdraft dampers on exhaust fans located at discharge side; see Section 23 33 00.

END OF SECTION 23 34 16

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SECTION 23 37 00 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Diffusers:

1. Perforated ceiling diffusers.
2. Rectangular ceiling diffusers.
3. Round ceiling diffusers.
4. Slot ceiling diffusers.

B. Registers/grilles:

1. Ceiling-mounted, egg crate exhaust and return register/grilles.
2. Ceiling-mounted, exhaust and return register/grilles.
3. Ceiling-mounted, linear exhaust and return register/grilles.
4. Ceiling-mounted, supply register/grilles.
5. Wall-mounted, supply register/grilles.
6. Wall-mounted, exhaust and return register/grilles.

C. Door grilles.

D. Louvers:

1. Combination louvers.

1.2 RELATED REQUIREMENTS

A. Section 09 91 23 - Interior Painting: Painting of ducts visible behind outlets and inlets.

1.3 REFERENCE STANDARDS

A. AHRI 880 (I-P) - Performance Rating of Air Terminals; 2017 (Reaffirmed 2023).

B. AMCA 500-L - Laboratory Methods of Testing Louvers for Rating; 2023.

C. AMCA 511 - Certified Ratings Program Product Rating Manual for Air Control Devices; 2021, with Editorial Revision (2022).

D. AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers; 2022.

E. ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets; 2023.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2020.

G. FLA (PAD) - Florida Building Code Online - Product Approval Directory; Current Edition.

H. Miami (APD) - Approved Products Directory; Miami-Dade County; Current Edition.

I. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

J. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

K. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible; 2020.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.1 ROUND CEILING DIFFUSERS

A. Type: Round, adjustable pattern, stamped or spun, multicore diffuser to discharge air in 360-degree pattern, with sectorizing baffles where indicated. Project diffuser collar not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.

B. Fabrication: Steel with baked enamel finish.

C. Color: As selected by Contracting Officer from manufacturer's full range.

2.2 RECTANGULAR CEILING DIFFUSERS

A. Type: Provide drawing-scheduled diffuser to discharge air in 360 degree pattern with sectorizing baffles where indicated.

B. Connections: Round.

C. Frame: Provide snap-in type.

D. Fabrication: Steel or Aluminum with baked enamel finish.

E. Color: As selected by Contracting Officer from manufacturer's full range.

2.3 PERFORATED FACE CEILING DIFFUSERS

A. Type: Perforated face with fully adjustable pattern and removable face.

B. Frame: Snap-in type.

C. Fabrication: Steel or aluminum with matching frame and baked enamel finish.

D. Color: As selected by Contracting Officer from manufacturer's full range.

2.4 CEILING SLOT DIFFUSERS

A. Type: Continuous slot in size and quantity as scheduled on drawings, with adjustable vanes for left, right, or vertical discharge. Adjacent diffusers shall have removable end pieces to be installed for continous slot appearance.

B. Fabrication: Aluminum extrusions with factory clear lacquer finish.

C. Color: To be selected by Contracting Officer from manufacturer's full range.

D. Frame: 1-1/4 inch margin with concealed mounting and gasket, mitered end border. Use open-end construction for adjacent slot diffusers for continuous slot appearance.

E. Plenum: Integral, galvanized steel, insulated.

F. Accessories: Face-adjustable cable for damper control where required, to avoid access panels in hard ceilings.

2.5 CEILING EGG CRATE EXHAUST AND RETURN GRILLES

A. Type: Egg crate style face consisting of 1/2 by 1/2 by 1/2 inch, 1/2 by 1/2 by 1 inch, and 1 by 1 by 1 inch grid core.

B. Fabrication: Grid core consists of aluminum or steel with baked enamel finish.

C. Color: To be selected by Contracting Officer from manufacturer's full range.

D. Frame: Channel lay-in frame for suspended grid ceilings.

E. Accessories: Provide 45 degree angled eggcrate or other similar provisions for visual blocking such as angled louver, 90 degree duct elbow, etc. where scheduled on drawings. Inside of visual blocking device should be painted flat black.

2.6 WALL SUPPLY REGISTERS/GRILLES

A. Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, single deflection.

B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

C. Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D. Color: To be selected by Contracting Officer from manufacturer's full range.

2.7 WALL EXHAUST AND RETURN REGISTERS/GRILLES

A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B. Frame: 1-1/4 inch margin with countersunk screw mounting.

C. Fabrication: Steel frames and blades, with factory baked enamel finish.

D. Color: To be selected by Contracting Officer from manufacturer's full range.

2.8 DOOR GRILLES

A. Type: V-shaped louvers of 20 gauge, 0.0359 inch thick steel, 1 inch deep on 1/2 inch centers.

B. Frame: 20 gauge, 0.0359 inch steel with auxiliary frame to give finished appearance on both sides of door, with factory prime coat finish.

2.9 LOUVERS

A. Type: 6 inch deep frame with drainable blades on 45 degree slope with center baffle and return bend, heavy channel frame, with factory furnished integral 1/2 inch square pvc-coated stainless steel mesh screen.

B. Fabrication: 16 gage, 0.0598 inch (1.52 mm) thick galvanized steel thick galvanized steel welded assembly, with factory Kynar 500 prime coat finish.

C. Color: As indicated on the drawings.

2.10 COMBINATION LOUVERS

A. Damper-combined, drainable louver:

B. Size: As indicated on the drawings.

C. Material: Extruded galvanized steel.

D. Linkage: Concealed in frame.

E. Custom Features: Include architectural finish.

F. Insulation: Water-resistant sound absorbing material.

G. Hurricane Zone Approved: FLA (PAD) and Miami (APD) listed using impact resistant aluminum material.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

C. Install diffusers to ductwork with air tight connection.

D. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.

E. Paint ductwork visible behind air outlets and inlets matte black, see Section 09 91 23.

3.2 PROTECTION

A. Protect installed products until completion of project.

B. Replace, repair, or touch-up damaged products before Substantial Completion.

END OF SECTION 23 37 00

SECTION 23 64 00 - AIR-COOLED MODULAR CHILLERS

PART 1 GENERAL

1.1 WORK INCLUDED

A. The air-cooled modular chiller system shall consist of individual chiller modules that are assembled on site. Each chiller module shall be completely factory wired and tested prior to shipment. Each module shall include a compressor, evaporator, air cooled condenser, and controls. Controls shall be designed on a distributed primary control system that allows the primary microprocessor to operate remaining secondary modules in the event of a malfunction of any secondary controller. The controls shall also be designed to allow each individual secondary microprocessor to operate on its own temperature sensor if there is a failure of the primary microprocessor.

1.2 REFERENCE STANDARDS

A. Unit shall be constructed in accordance with the UL 60335 2-40 and NEC standards and be UL or ETL listed.

B. Unit shall be rated and tested in accordance with ARI 550/590 – Standard for Water Chilling Packages.

C. Unit shall meet the safety standards of ANSI/ASHRAE 15 – Safety Standard for Refrigerated Systems.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Submit complete drawings including cabinet dimensional details and anchor point locations, required clearances, location and sizes of field connections, performance data, electrical wiring diagrams, dry and operation weights, and all required electrical data.

C. Submit manufacturer’s installation instructions, including any remote panel installation instructions.

D. Operating and Maintenance manuals: provide two copies of current commercial manuals.

1.4 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for chiller performance must include an AHRI approved selection method. Verification of date and version of computer program selection or catalog is available through AHRI.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer’s installation instructions for rigging, unloading, and transporting units.

B. Protect units on site from physical damage after unloading.

1.6 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Provide a full parts warranty for one 12 months after installation.

C. Provide a refrigerant warranty for 12 months after installation.

D. Provide an additional five year compressor warranty.

PART 2 PRODUCTS

2.1 CHILLER DESCRIPTION

A. Each module shall be assembled on a powder coated, formed galvanized sheet metal frame and panels. The module shall be shipped individually and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment.

B. System shall use R-454B refrigerant

2.2 FRAME

A. Frame shall be constructed of white powder coated formed galvanized sheet metal.

B. The module(s) shall ship individually and assembled on site.

2.3 CABINET

A. White powder coated formed galvanized sheet metal panels that shall be easily removable for servicing via stainless steel fasteners and retaining clips.

B. Power will be individual to each module.

2.4 COMPRESSORS

A. Hermetically sealed, scroll compressor on each refrigeration circuit each with independent connections, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and circuit breaker protection. There shall be two independent compressors and refrigerant circuits per module. Compressors shall be mounted to the heavy gauge steel frame with rubber-in-shear vibration isolators.

B. The lead chiller module shall have a variable speed drive (VSD) on the lead scroll compressor on the lead refrigeration circuit and standard scroll compressor on the lag circuit. Remaining modules shall have standard scroll compressors. The VSD scroll compressor shall provide smooth and efficient operation from 35 Hz to 60 Hz for close temperature control. This part load operation shall lower operating noise as well as the compressor condensing temperatures thereby lowering power consumption during low cooling load demands.

2.5 EVAPORATOR

A. Dual circuit, brazed plate heat exchanger on each module constructed of 316 stainless steel plates and copper brazing. The fluid connections to each heat exchanger shall use roll grooved couplings for service convenience and ease of installation. Each heat exchanger shall be insulated with ¾" closed cell insulation. The maximum working pressure shall be 650 psi. Piping fluid velocity shall not exceed 10 fps at any point in the system.

2.6 ISOLATION VALVES

A. Each evaporator branch line shall include a manual inlet and an electronic discharge butterfly valve that allows system flow to each active module to match the cooling requirements of the system. By isolating individual modules that are not operating, this allows the hydronic system

to have variable primary flow. The valves shall be the slow opening type to minimize the sudden change in flow to the previously active modules. The valves shall have a minimum opening cycle time of 30 seconds between the fully closed and open position and shall have roll grooved connections. The valves shall have a minimum close off pressure of not less than 75 psi and shall be rated for a maximum working pressure of 250 psi. The actuators shall be rated for 24 VAC

2.7 FILTERS

A. A 40-mesh industrial grade filter strainer shall be factory installed between the header system and each brazed plate heat exchanger. The strainer shall be serviceable by isolation valves that permit each strainer to be removed and cleaned without shutting down fluid flow or power to the entire system and allowing the remaining modules to continue to operate. In-line strainers that require complete system shutdown for service and isolation are not acceptable.

2.8 CONDENSER

A. Standard Finned Coil - Aluminum fins mechanically bonded to copper tubes with integral subcooling circuits. Fin spacing shall not exceed 16 fins per inch. The coils shall be sized to provide full heat of rejection at jobsite elevation above sea level, at a maximum 25 degree F temperature difference between the condensing temperature and ambient air temperature. The coils shall be factory tested to a minimum of 600 psig.

B. The condenser controls shall include pressure actuated fan cycling controls on each condenser fan motor to maintain proper head pressure control in ambient temperatures down to 0 degree F

2.9 FANS

A. The condenser fan motors shall be maintenance free, quiet, highly efficient Electronically Commutated Motors (ECM) with energy reduction capabilities of up to 35%. These variable speed fan assemblies shall vary fan motor RPM to maintain the refrigeration pressure of the chiller modules.

B. Each fan contains a diffuser that shall improve the efficiency and reduce the noise of the ECM fans. By increasing the fan efficiency, the motor speed can be reduced thereby lowering the sound pressure.

2.10 CHILLED WATER PIPING

A. The chilled fluid piping shall be Schedule 40 steel and be insulated using closed cell pipe insulation to prevent condensation and to retain temperature. The pump module shall connect to the adjacent modules using roll grooved steel couplings and neoprene gaskets. Any type of module-to-module pipe connection external to the modules is unacceptable.

2.11 REFRIGERANT PIPING AND ACCESSORIES

A. Refrigerant piping shall be Type K seamless copper, insulated with closed cell pipe insulation on the suction lines.

B. Each refrigerant circuit shall include compressor service valves, solenoid valves for compressor pumpdown, and Schrader service valves in the suction, discharge, and liquid lines, liquid line sight glass with moisture indicator and a filter dryer.

2.12 CONTROLS

A. The primary chiller module shall incorporate the primary microprocessor controller. The primary microprocessor shall communicate with the remaining secondary microprocessors in each module via a local network communications protocol. The primary microprocessor shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The primary controller shall read all analog and fault port values from all secondary module controllers and shall pass these values to the Building Automation System via BACnet protocols. Each chiller control system shall include operational switches for each compressor; high and low pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms including shutting shut down the responsible compressor(s); anti-short cycling compressor timers; minimum compressor run timers; flow switches, connection to Building Automation System (if required).

2.13 MICROPROCESSOR

A. The microprocessor shall provide the following minimum functions and alarms:

1. Adjustable fluid temperature set point
2. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
3. High and low fluid temperature alarm set points
4. Water inlet and outlet temperature
5. Suction and discharge refrigeration pressures
6. Compressor run status
7. Current alarm status
8. Demand load
9. Compressor run hours
10. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
11. Remote start stop input
12. Dry contact for general alarm
13. Chilled water flow proof.

2.14 INTERFACE PANEL

A. An operator 7” touch screen interface panel with graphical display shall be installed on the master module to allow chiller operation monitoring, adjustment of user set points, and alarm monitoring.

2.15 BMS INTERFACE

A. The primary microprocessor controller shall provide communications to the building management system via RS-485 serial communications card. The system shall interface with the BMS via BACnet MS/TP or BACnet IP/Ethernet. All functions of the control system shall be accessible from the BMS including:

1. Chiller enable/disable
2. Compressor run status
3. System evaporator and condenser temperatures
4. Adjustment of all system set points

5. Review and resetting of all non-active faults
6. Interrogation and display of all sensor faults

PART 3 – EXECUTION

3.1 3.1 INSTALLATION

A. A. An operator 7” touch screen interface panel with graphical display shall be installed on the master module to allow chiller operation monitoring, adjustment of user set points, and alarm monitoring.

B. 2.15 BMS INTERFACE

C. A. The primary microprocessor controller shall provide communications to the building management system via RS-485 serial communications card. The system shall interface with the BMS via BACnet MS/TP or BACnet IP/Ethernet, MODBUS or LonWorks. All functions of the control system shall be accessible from the BMS including:

END OF SECTION 23 64 00

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SECTION 23 73 10 - FAN COIL UNITS

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems; 2024.

B. UL 181 - Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

C. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 15950 - Controls and Instrumentation: Thermostats and control components.

B. Section 16180 - Equipment Wiring Systems: Thermostats and control components.

1.3 RELATED SECTIONS

A. Section 15751 - Glycol System.

B. Section 15900 - Building Automation and Control Systems

C. Section 15950 - Controls and Instrumentation.

D. Section 16180 - Equipment Wiring Systems: Electrical supply to units.

1.4 REFERENCES

A. NFPA 90A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.

B. UL 181 - Factory-Made Air Ducts and Connectors.

C. UL 1995 - Heating and Cooling Equipment.

D. NMFC item 180: Package Performance Testing in accordance with National Motor Freight Classification.

E. AHRI 260-2001 - Standard for Sound Rating of Ducted Air Moving and Conditioning Equipment.

1.5 QUALITY ASSURANCE

A. Unit designed and tested in compliance with AHRI 430 air delivery ratings per AHRI 430-2014.

B. Unit designed and tested in compliance with AHRI 260-2001.

1.6 SUBMITTALS

A. Submit unit performance data including: capacity, nominal and operating performance.

B. Submit Mechanical Specifications for unit and accessories describing construction, components, and options.

C. Submit shop drawings indicating overall dimensions as well as installation, operation, and service clearances. Indicate lift points and recommendations. Indicate unit shipping, installation and operating weights including dimensions.

D. Provide fan curves with specified operating point clearly plotted.

E. Submit data on electrical requirements. Include safety and start-up instructions.

1.7 REGULATORY REQUIREMENTS

A. Unit shall be manufactured to conform to UL 1995 and shall be listed by either UL/CUL or ETL. Units shall be provided with listing agency label affixed to the unit.

B. In the event the unit is not UL/CUL or ETL approved, the contractor shall, at his/her expense, provide for a field inspection by a UL/CUL or ETL representative to verify conformance. If necessary, contractor shall perform modifications to the unit(s) to comply with UL/CUL or ETL as directed by the representative, at no additional expense to the Owner.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

B. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags on each section to indicate location and orientation in direction of airflow. Each section shall have lifting points to allow for field rigging and final placement of section.

C. Store in a clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

D. Deliver units to site with electronically commutated fan motors factory mounted in units. If these components are not completely assembled, contractor shall be responsible for all expenses associated with installation, testing, and vibration balancing of fan(s).

1.9 START-UP AND OPERATING REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters in place, condensate properly trapped, piping connections verified and leak-tested, all shipping braces removed, and fan has been test run under observation.

1.10 WARRANTY

A. The equipment manufacturer shall provide, at no additional cost, a STANDARD PARTS WARRANTY that covers a period of one year from unit start-up or 18 months from shipment, whichever occurs first. This warrants that all products are free from defects in material and workmanship and shall meet the capacities and ratings set forth in the equipment manufacturer's catalog and bulletins.

PART 2 PRODUCTS

2.1 GENERAL UNIT DESCRIPTION

A. Manufacturer shall provide unit arranged for draw-through application. Unit layout and configuration shall be as defined in project plans and schedule. Blow-through is only acceptable when consideration is given to capturing downstream moisture carryover. Considerations include downstream moisture eliminators and/or extended blank modules with condensate drain pans.

2.2 UNIT CASING

A. The entire air handler shall be constructed of galvanized steel. The removal of access panels shall not affect the structural integrity of the unit once the unit is installed. Contractor shall be responsible to provide connection flanges and all other framework that is needed to properly support the unit.

B. Access panels shall be on side of the unit in all sections to allow easy access to drain pan, filter, coil(s), and motor components for cleaning, inspection, and maintenance.

C. Units shall each ship as fully assembled modules, including all coils, fans, motors, mixing box, attenuators and filters.

D. Access Panels: Removable access panels shall be provided on side of the unit to facilitate service access to drain pans, motors, coil(s). Access panel for filter removal shall be provided on bottom of unit.

E. Cabinet: Casing shall be manufactured of heavy gauge galvanized steel.

F. INSULATION - High density, matte-faced - Interior surface of unit casing shall be acoustically (in single-wall modules) and thermally lined. Insulation shall have a minimum R-Value of 4 and shall be UL Listed. The insulation shall comply with NFPA 90A and B, and UL191 requirements.

2.3 COILS

A. Install coils such that headers and return bends are enclosed by unit casing to ensure that if condensate forms on the header or return bends, it is captured by the drain pan under the coil.

B. Coils shall be manufactured with plate fins to minimize water carryover and maximize airside thermal efficiency. Fin tube holes shall have drawn and belled collars to maintain consistent fin spacing to ensure performance and air pressure drop across the coil are as scheduled. Tubes shall be mechanically expanded and bonded to fin collars for maximum thermal conductivity. Use of soldering or tinning during the fin-to-tube bonding process is not acceptable due to the inherent thermal stress and possible loss of bonding at that joint.

C. Construct coil casings of galvanized steel. End supports shall have belled tube holes to minimize wear of the tube wall during thermal expansion and contraction of the tube.

D. Chilled Water Coil

1. Supply and return header connections shall be clearly labeled on outside of units, such that direction of coil water-flow is counter to direction of unit air-flow.
2. Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water.
3. Headers shall be constructed of round copper pipe.
4. Unit shall be provided with minimum 3/8 inch O.D. copper coils. All fins shall be aluminum.
5. All coil connections shall be on same side of unit.

E. Electric Heating Coil:

1. Open-wire nickel-chromium elements with thermal cut outs.
2. Magnetic contactors with minimum 3 stages of heat.

2.4 DRAIN PAN

A. Drain Pan(s) shall be constructed of corrosion resistant material. Acceptable materials include polymer or stainless steel. Units with cooling coils shall have drain pans under complete cooling coil section that extend beyond the air-leaving side of the coil to ensure capture of all condensate in section.

B. Drain pan manufacturer shall either insulate bottom of drain pan with closed cell foam or provide double wall internally insulated construction to eliminate bottom sweating.

C. Drain pan shall be sloped in two planes, pitched toward drain connections to ensure complete condensate drainage when unit is installed level and trapped per manufacturer's installation instructions. Units without drain pans sloped in two planes shall coat drain pans with anti-microbial treatment.

D. Drain pan(s) shall have main and auxiliary drain connections with auxiliary outlet higher than the main connection.

E. Coil(s) shall be mounted above the drain pan to facilitate easy and complete inspection, cleaning, and removal. Coil(s) may not sit in drain pan.

2.5 FANS

A. Provide single-wheel, dual-width, dual-inlet, forward curved centrifugal fans as specified on the schedule. All fans shall be dynamically balanced.

2.6 MOTORS

A. All motors shall be factory-installed and run tested. To facilitate field replacement of motors, a removable fan inlet cone shall be provided on the drive side of the fan/motor assembly.

B. Motor shall be ECM programmable type. The motor shall be preprogrammed in the factory to meet the specified airflow requirements.

C. Fan motor shall have permanently lubricated and sealed bearings, protected by an internal thermal overload.

D. Single phase motors shall be selected to operate continuously at 104 F (40 C) ambient without tripping on overloads. Motors shall have a +/- 10 percent voltage utilization range to protect against voltage variation.

E. Manufacturer shall provide for each fan a nameplate with the following information to assist air balance contractor in star-up and services personnel in maintenance:

1. Fan motor part number
2. Fan design RPM and motor HP
3. Motor Full Load Amps

2.7 FILTERS

A. Provide removable one- or two-inch thick filters easily removable from bottom of the unit. All units shall use standard filter sizes.

2.8 ELECTRIC HEAT

A. Electric heating coils are factory-wired and installed two-stage electric heating coil with over-temperature protection and magnetic contactors. Mercury contactors are not allowed. Secondary backup protection provided.

B. Electric heaters rated above 48 amps shall be circuited so that no circuit exceeds 48 amps as required by UL and NEC.

C. Units with electric he shall be provided with a single point power connection for the fan motor and electric heater.

D. Electric heaters shall include Interlocking disconnect switch.

2.9 CONTROLS

A. Fan motor and end devices shall be wired back to a control box enclosure. A junction box shall be provided for single point power connection.

B. The control package shall include the following at a minimum:

1. 24 VAC transformer
2. Disconnect switch

C. The control package shall include the following options :

1. Fan status relay
2. Electric heat interface
3. Discharge air sensor

PART 3 EXECUTION

3.1 SHIPPING

A. Paper copies of the IOM shall also be shipped with each unit.

B. The manufacturer shall identify all shipments with the order number. Enough information shall be provided with each shipment to enable the Mechanical Contractor to confirm the receipt of units when they are received. For parts too small to mark individually, the manufacturer shall place them in containers.

C. To protect equipment during shipment and delivery, unit air inlet and outlet openings shall ship from manufacturer with removable sealed covering. Covering shall not constrain the unit installation process.

D. After loading the equipment for shipment, the manufacturer shall contact the shipping contact on the order and provide the name of the carrier, description of equipment, order number, shipping point, and date of shipment.

3.2 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on the shop drawings and contract documents.

B. Mechanical contractor shall verify that the proper power supply is available prior to starting the fan.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide units with shut-off valve on supply and lockshield balancing valve on return piping if factory packages are not factory provided.

3.4 CLEANING

A. Clean work.

B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.

C. Ensure all shipping materials have been removed.

D. Install new filters.

END OF SECTION 23 73 10

SECTION 23 81 29 - VARIABLE REFRIGERANT FLOW HVAC SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Air-source outdoor units.

B. Refrigerant piping.

C. Refrigerant branch units.

D. Indoor units.

1.2 RELATED REQUIREMENTS

A. Section 23 23 00 - Refrigerant Piping.

B. Section 26 05 83 - Wiring Connections: Power connections to equipment.

C. Section 28 44 00 - Refrigerant Detection and Alarm.

1.3 REFERENCE STANDARDS

A. AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.

B. AHRI 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; 2021.

C. AHRI Std 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air Conditioning and Heat Pump Equipment; Current Edition, Including All Revisions and Addenda.

D. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

E. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; 2024, with Errata (2025).

F. ASHRAE Std 34 - Designation and Safety Classification of Refrigerants; 2024, with Addendum (2025).

G. ASHRAE Std 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks; 2024, with Errata (2025).

H. ITS (DIR) - Directory of Listed Products; Current Edition.

I. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 1995 - Heating and Cooling Equipment; Current Edition, Including All Revisions.

L. AHRI Std 1230 - Performance Rating of Variable Refrigerant Flow (VRF) Multi-Split Air-Conditioning and Heat Pump Equipment; Current Edition, Including All Revisions and Addenda.

M. ASHRAE Std 15 - Safety Standard for Refrigeration Systems; Current Edition, Including All Revisions.

N. ASHRAE Std 34 Designation and Safety Classification of Refrigerant; Current Edition, Including All Revisions.

1.4 DEFINITIONS

A. COP: Coefficient of Performance - Ratio of useful heating or cooling energy obtained to work input required.

B. EER: Energy Efficiency Ratio - The ratio of a system's heating or cooling capacity to power input at peak operating capacity.

C. IEER: Integrated Energy Efficiency Ratio - The ratio of a system's heating or cooling capacity to power input, as rated across a range of operating capacities from partial to full loading.

1.5 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; **require attendance by all affected installers and manufacturer's startup specialist.**

1.6 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents.

1. Control Panels: Complete description of options, control points, zones/groups.

C. Refrigerant System Pressure Test:

1. Provide written documentation of refrigerant system pressure tests for each VRF system. See PART 3 EXECUTION for pressure test documentation requirements.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.

B. Installer Qualifications: Trained and approved by manufacturer of equipment.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

1.9 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Compressors: Provide manufacturer's warranty for ten (10) years from date of startup. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced by the manufacturer. All warranty service work shall be performed by a manufacturer factory trained service professional.

PART 2 PRODUCTS

2.1 VARIABLE REFRIGERANT FLOW SYSTEM

A. Minimum System Requirements:

1. System Testing, Capacity Rating, and Performance:
   a. AHRI 1230 when cooling capacity is equal or greater than 65,000 Btu/h.
   b. AHRI 210/240 when cooling capacity is below 65,000 Btu/h.
2. Safety Certification: Bear UL 1995 tested and ITS (DIR) listed certification label.
3. Outdoor Units: Furnish installation and surface support hardware products in accordance with ASCE 7 for wind restraint.
4. System Performance: Conform to all performance numbers indicated below, unless specifically noted otherwise on drawings.
   a. Cooling Mode Interior Performance:
      1) Daytime Setpoint: 78 degrees F, plus or minus 2 degrees F.
      2) Interior Relative Humidity: 50 percent, maximum.
      3) Heating Mode Interior Performance:
         (a) Setpoint: 68 degrees F, plus or minus 2 degrees F.

2.2 AIR-SOURCE OUTDOOR UNITS

A. Air Conditioning Type:

1. DX refrigeration unit piped to one or more compatible indoor units either directly or indirectly through one or more intermediate refrigeration branch units.

B. Unit Cabinet:

1. Capable of being installed with wiring and piping to the left, right, rear or bottom.
2. Designed to allow side-by-side installation with minimum spacing and vibration isolation.
3. Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
4. Sound Pressure Level: 55 dB measured at 3 feet from front of unit.

C. Heat Sink Side:

1. Condenser Fans:
   a. Provide minimum of 2 fans for each condenser within the outdoor unit.
   b. Minimum External Static Pressure: Factory set at 0.12 in-wc.
   c. Fan Type: Vertical discharging, direct-driven propeller type with variable speed operation using DC-controlled ECM motors mechanically connected using permanently lubricated bearings having whole assembly protected with fan guards.
2. Condenser Coils:
   a. Hi-X seamless copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
   b. Corrosion Protection: Fins and pipes coated with anticorrosion coating as standard with a minimum salt spray test rating of 950hr (ASTM B117 & Blister Rating:10), Acetic acid salt spray test: 500hr (ASTM G85 & Blister Rating:10).

D. Refrigeration Side:

1. Factory assembled and wired with instrumentation, switches, and controller(s) to handle unit specifics with direct coordination of remote controller(s) from indoor unit(s).
2. Refrigeration Circuit: ECM driven dual scroll compressors, fans, condenser heat sink coil, expansion valves, solenoid valves, distribution headers, capillaries, filters, shutoff valves, oil separators, service ports, and refrigerant regulator.
3. Variable Volume Control: Modulate compressed refrigerant capacity automatically to maintain constant suction and condensing pressures under varying refrigerant volume required to handle remote loads. Include defrost control.
4. Provide refrigerant subcooling to ensure the liquid refrigerant does not flash when supplying to use indoor units.
5. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle, oil return, or defrost is not permitted due to potential reduction in space temperature.
6. Power Failure Mode: Automatically restarts operation after power failure without loss of programmed settings.
7. Safety Devices: High pressure sensor with cut-out switch, low pressure sensor with cut-out switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, overcurrent protection for the inverter and antirecycling timers.
8. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.

E. Local Controls:

1. Include factory-wired instruments, sensors, switches, and safeties for unit control.
2. Configured to coordinate internal unit operation with remote indoor units and with built-in capacity to coordinate other manifolded outdoor units and remote refrigerant branch unit(s).
3. Include screen and button interface to setup operating schedules, setpoints, alarms, and remote unit setpoint coordination. Also used for system troubleshooting.
4. Self diagnostic, auto-check functions to detect malfunctions and display the type and location.

F. BAS, SCADA, or other Integrated Automation Link: ASHRAE Std 135 BACnet IP.

G. Power:

1. Electrical Requirement: As scheduled on drawings.
2. Outdoor Mounted: Provide fused NEMA EN 10250 Type 4X disconnect switch.

2.3 REFRIGERANT PIPING

A. Two-Pipe Run: Provide low-pressure vapor and high-pressure vapor gas pipes for each indoor unit selected for seasonal heating or cooling service.

B. Three-Pipe Run: Provide low-pressure vapor, high-pressure vapor gas, and liquid pipes for each indoor unit selected for off-season heating and cooling changeover service.

C. Refrigerant Flow Balancing: Provide refrigerant piping joints and headers specifically designed to ensure proper refrigerant balance and flow for optimum system capacity and performance; T-style joints are prohibited.

D. **Refrigerant piping systems serving VRF equipment shall use hard-drawn piping only. Do not use soft tubing <u>at any point</u> in the system, unless specifically directed by the manufacturer.**

1. Refer to Section 23 23 00 - Refrigerant Piping for additional requirements.

2.4 REFRIGERANT BRANCH UNITS

A. Outdoor unit interface to handle two or more indoor units required to do automatic off-season heating and cooling changeover.

B. Concealed box consisting internally-piped refrigeration loops, subcooling heat exchanger, and other devices coordinated by electronic valves to facilitate off-season load management between outdoor and indoor units.

C. Minimum Requirements:

1. Provide one electronic expansion valve for each downstream indoor unit served except when multiple indoor units are connected, provide balancing joints in downstream piping to keep total capacity within branch unit capacity.
2. Energize subcooling heat exchanger during simultaneous heating and cooling service.
3. Casing: Galvanized steel sheet with flame and heat resistant foamed polyethylene sound and thermal insulation.
4. Refrigerant Connections: Braze type.
5. Isolation Valves: Unless specifically noted otherwise, **include isolation valves on all ports on a branch selector box,** not just the ports scheduled for use.
6. **Condensate Drainage: Provide sub-branch selector unit that does not require condensate drainage.**

2.5 INDOOR UNITS

A. Minimum Unit Requirements:

1. DX Evaporator Coil:
   a. Copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
   b. 2-, 3-, or 4-row cross fin design with 14 to 17 fins per inch and flare end-connections.
   c. Provide thermistor on liquid and gas lines wired into local controller.
   d. Refrigerant circuits factory-charged with dehydrated air for field charging.
2. Fan Section:
   a. Variable or three-speed ECM fan with automatic airflow adjustment; external static pressure selectable during commissioning.
   b. Thermally protected, direct-drive motor with statically and dynamically balanced fan blades.
   c. Minimum-adjustable external static pressure 0.32 in-wc; provide for mounting of field-installed ducts.
3. Local Unit Controls:
   a. Temperature Control: Return air control using thermistor tied to computerized Proportional-Integral-Derivative (PID) control of superheat.
   b. Temperature Zones:
      1) Single Indoor Unit: Set served space(s) as the local temperature zone.

2) Multiple Indoor Units: For large zones, group and coordinate related indoor units with served spaces as the local temperature zone with each indoor unit as sub-zone.

4. Return Air Filter:
   a. Manufacturer's standard, monitored with adjustable static pressure switch.
   b. Provide air filter rack for non-manufacturer's standard filters.
5. Condensate:
   a. Built-in condensate drain pan with PVC drain connection for drainage.
   b. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
   c. Units Without Built-In Condensate Pump: Provide built-in condensate float switch and wiring connections.
6. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that all required utility services and support infrastructures have been installed and are in the proper locations, and that all disciplines such as Fire Protection, Electrical, and Plumbing have been coordinated to ensure proper maintenance clearances are maintained, prior to starting installation. Beginning work shall indicate acceptance of existing conditions.

3.2 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

B. Install refrigerant piping in accordance with equipment manufacturer's instructions, and with Section 23 23 00 - Refrigerant Piping.

C. **It is EXCEPTIONALLY IMPORTANT that all refrigerant piping and fittings used in VRF systems be protected from dust, dirt, and moisture, and that they be adequately protected and purged before, during, and after hot work to prevent scale buildup inside the pipes.** Failure to comply with proper housekeeping and hot work requirements in Section 23 23 00 - Refrigerant Piping **will result in rejection of the system as a whole**, and may void the manufacturer equipment warranty. **Contractor shall be responsible for ensuring that proper housekeeping and installation procedures are followed for refrigerant piping on all VRF systems, and shall assume the costs of corrective action undertaken for any and all damages, rework, redesign, equipment replacement, or schedule delays associated with substandard work.**

D. Perform wiring in accordance with NFPA 70, National Electric Code (NEC).

E. Coordinate with installers of systems and equipment connecting to and installed in proximity to this system. Ensure that all required maintenance clearances are maintained for control panel access as well as general maintenance panel access.

F. Unit Refrigerant Isolation Valves: Provide full-flow external refrigerant isolation ball valves at the refrigerant connections to each piece of equipment, to allow the equipment to be isolated from the common refrigerant system and then serviced or replaced without pumping down the system.

3.3 SYSTEM PRESSURE TEST

A. Provide system pressure testing in accordance with manufacturer's instructions. Pressure test shall be documented and shall be both witnessed and approved by the manufacturer's representative in writing.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Provide manufacturer's field representative to inspect installation prior to startup.

3.5 SYSTEM STARTUP

A. Provide manufacturer's field representative to perform system startup.

B. Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C. Adjust equipment for proper operation within manufacturer's published tolerances.

3.6 CLEANING

A. Clean exposed components of dirt, finger marks, and other disfigurements.

B. **Do not paint over manufacturer equipment labels.**

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 23-Operation and Maintenance Data for additional submittals.

B. Demonstrate proper operation of equipment to Government's designated representative.

C. Demonstration: Demonstrate operation of system to Government's personnel.

1. Use operation and maintenance data as reference during demonstration.
2. Conduct walking tour of project.
3. Briefly describe function, operation, and maintenance of each component.

D. Training: Train Government's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of 16 hours of training, divided between at least three sessions with the first and last session being at least 10 months apart.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.

3.8 PROTECTION

A. Protect installed components from subsequent construction operations.

B. Replace exposed components broken or otherwise damaged beyond repair.

END OF SECTION 23 81 29

SECTION 26 00 50 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.1 DESCRIPTION AND DEFINITIONS

A. See Section 01 42 16 - Definitions.

B. This division of the Specifications covers the complete electrical systems as indicated on the drawings or as specified herein. Provide all equipment, materials, labor, and supervision to install electrical systems. The requirements of this Section apply to all electrical work hereinafter described. The General and Special Conditions are considered a part of this Division of the Specifications and all provisions contained therein which affect this work are as binding as though incorporated herein.

1.2 QUALITY ASSURANCE

A. Refer to Section 01 40 00 - Quality Requirements for additional details.

B. Material Standards: All material shall conform to the standards where such standards have been established for the particular material indicated. Publications and standards of the organizations listed below are applicable to materials specified herein.

1. American National Standards Institute (ANSI)
2. Insulated Cable Engineers Association (ICEA)
3. Institute of Electrical and Electronic Engineers (IEEE)
4. National Electrical Manufacturers Association (NEMA)
5. National Fire Protection Association (NFPA)
6. Underwriters' Laboratories, Inc. (UL)

C. Listing and Labeling: Provide equipment assemblies that are listed and labeled.

1. The terms "listed" and "labeled": As defined in the National Electrical Code, Article 100.
2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" (NRTL) as defined in OSHA Regulation 1910.7.

1.3 PERMITS

A. Obtain all permits and inspections for the installation of this work and pay all charges incident thereto. Deliver to the Government all certificates of said inspection issued by Authority Having Jurisdiction (AHJ).

1.4 WARRANTY

A. The Contractor warrants to the Government and Contracting Officer that materials and equipment furnished under this Contract will be of good quality and new unless otherwise required or permitted by the Contract Documents, that the Work will be free from defects not inherent in the quality required or permitted, and that the Work will conform with the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, will be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Design-Builder, the Contractor

shall furnish satisfactory evidence as to the kind and quality of materials and equipment. Refer to Division 1 for other warranty requirements.

1.5 PROJECT DOCUMENTS

A. Keep on hand at the project site (or provide digital access to installers throughout the course of the project) a complete set of all project drawings and specifications, including, but not limited to, all architectural and engineering drawings. Refer to these documents, coordinate and install all work accordingly so that all electrical equipment will be properly located and accessible.

B. The drawings are diagrammatic and are intended to indicate the arrangements of electrical equipment. Do not scale drawings. Obtain dimensions for layout of equipment from drawings of other trades unless indicated on Electrical plans. Review drawings of other trades for door swings, cabinets, counters, and built-in equipment; conditions indicated on Architectural plans shall govern. Coordinate installation of electrical equipment with structural system and mechanical equipment and access thereto. Coordinate installation of electrical equipment with ductwork and piping, and wall thickness. Verify construction dimensions at the site and make changes to conform to the building as constructed. Work improperly installed due to lack of construction verification shall be corrected at no additional cost to the Contract.

C. If substitution of alternate equipment is requested, Contractor is responsible for any and all costs required by the substitution, including necessary engineering and construction revisions in their – or any – contract or trade to satisfy the design intent shown on the Drawings and described in the Specifications.

D. If the products and equipment used as the basis of design are modified, coordinate with all other trades prior to purchasing any material or equipment. Such coordination shall occur before purchasing and delivering equipment from the manufacturer and shall be clearly indicated on the shop drawings. Perform all related modifications without incurring cost to the Contract.

E. Bring all discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions to the immediate attention of the Contracting Officer.

1.6 SUBMITTALS

A. Shop Drawings and Product Data:

1. IMPORTANT: Refer to Section 01 33 23-Submittal Procedures for submittal format! Submittals that do not conform with the requirements of this section will be returned without review.

B. Submit data for materials and equipment to be used on the project to the Contracting Officer for review. Submittals shall be supported by descriptive material, catalog cuts, diagrams, and performance charts published by the manufacturer to show conformance to specification and drawing requirements. Model numbers alone will not be acceptable. Provide documentation of complete electrical characteristics for all equipment.

C. Provide equipment layout plans, drawn to ¼”=1’-0”, showing the space arrangement of electrical spaces such as main service equipment area, electrical closets, and each area where electrical distribution equipment is to be installed. Base layout on dimensions of the equipment submitted for use on the project. Submit plans for review with shop drawings.

D. Refer to the individual sections for indication of equipment for which submittals are required.

E. Record Documents: Refer to Section 01 77 00 – Closeout Procedures for requirements for record documents, as-built drawings, and related submittals.

F. MECHANICAL/PLUMBING COORDINATION STATEMENT: Submit a written statement with each submittal confirming coordination of voltage and power connection requirements for all Mechanical and Plumbing equipment and controls submittals requiring electrical connection. Statement shall bear the names and signatures of the Mechanical and Plumbing subcontractors.

1.7 EQUIPMENT REQUIRING ELECTRICAL SERVICE

A. Review all specification sections and drawings for equipment requiring electrical service. Provide service to and make connections to all equipment requiring electrical service.

B. Drawings indicate equipment with loads, horsepower ratings, voltages, and corresponding control equipment, feeders, and overcurrent devices which were used as a basis for design. If equipment actually furnished have loads other than those indicated on the drawings or specified herein, control equipment, feeders, and overcurrent devices shall be adjusted in size accordingly at no additional cost to the Owner. Such adjustment shall be subject to the review of the Contracting Officer.

C. Incidental items not indicated on the drawings or mentioned in the specifications but that can legitimately and reasonably be inferred to belong to the work and in good practice to provide a complete system, shall be furnished and installed as though itemized here in detail.

1.8 MECHANICAL SYSTEMS INTERFACE

A. See Divisions 21, 22 and 23 for all low-voltage (<120V) control wiring for mechanical systems, unless otherwise indicated on the Electrical drawings. See Division 26 for associated raceway systems specifications. Coordinate with all divisions to determine location and quantity of control conduits.

B. Unless otherwise indicated, motor controllers (starters) shall be specified under Division 21, 22 and 23 as an integral component of Division 21, 22 and 23 equipment.

C. Power wiring and associated raceway systems to all motors and controllers and between motors and controllers shall be as specified under Division 26.

D. Power to low-voltage (<120V) controllers shall be as specified under Division 26. Power downstream of low-voltage controllers shall be as specified under Divisions 21, 22, and 23.

1.9 QUALITY ASSURANCE

A. **NOTICE: Manufacturer's Startup Representative Qualifications:** Unless specifically noted otherwise in the specifications or drawings, when the project documents specify startup services by a manufacturer's factory technician or representative, those services may not be delegated to the contractor or subcontractor who performed the installation, but must be provided directly by the manufacturer's personnel or by the manufacturer's contracted independent third party representative.

PART 2 PRODUCTS

2.1 MATERIALS

A. Furnish all materials specified herein or indicated on the drawings. All materials shall be new, unless otherwise indicated.

B. Where Underwriters' Laboratories (UL) testing standards and listings exist for an item of material or equipment, the listed material shall bear the UL label.

PART 3 - EXECUTION

3.1 PRODUCT DELIVERY, STORAGE, HANDLING, AND PROTECTION

A. Inspect materials upon arrival at site and verify conformance with project requirements. Prevent unloading of unsatisfactory material. Handle materials in accordance with applicable standards and recommendations, and in a manner to prevent damage to materials. Store packaged materials in original undamaged condition with manufacturer's labels and seals intact. Containers which are broken, opened, damaged, or watermarked are unacceptable and shall be removed from the premises and replaced.

B. All material, except items specifically designed to be installed outdoors, shall be stored in an enclosed, dry building or trailer. Areas for general storage shall be provided. Provide temperature and/or humidity control where needed. All material for interior installation, including conductors, shall be stored in an enclosed weathertight structure and shall be protected from water, direct sunlight, cold or heat. Equipment stored other than as specified above shall be removed from the premises and replaced.

C. Equipment and materials shall not be installed until such time as the environmental conditions of the job site are suitable to protect the equipment or materials. Conditions shall be those for which the equipment or materials are designed to be installed.

3.2 SEISMIC AND WIND DESIGN

A. Install hangers and supports to allow controlled thermal and seismic movement of wiring, conduit, raceways, lighting, electrical fixtures, and equipment, to permit freedom of movement between anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units, and to protect similar exterior-mounted equipment and components against the effects of high velocity winds. See Structural drawings for project Seismic Design Classification and for Wind Design Classification.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

3.3 CLEANING, PAINTING AND IDENTIFICATION

A. Remove oil, dirt, grease and foreign materials from all raceways, boxes, panelboard trims and cabinets to provide a clean surface for painting. Touch-up scratched or marred surfaces of lighting fixtures, panelboard and cabinet trims, or other equipment enclosures with paint furnished by the equipment manufacturer specifically for that purpose.

B. Where painting of trim covers for flush mounted panelboards, communication equipment cabinets, pull boxes, junction boxes, and control cabinets is part of this or any other Division of these specifications, remove trim covers before painting. Do not paint locks, latches, hinges, or exposed trim clamps.

C. Where plywood backboards are used to mount equipment provided under Divisions 26, 27, or 28, paint backboards with two coats of light gray paint. Provide fire-retardant plywood, 3/4" thick minimum.

D. Identify electrical components in the individual specification sections. See Section 26 05 53 - Identification for Electrical Systems for identification requirements.

3.4 EXCAVATION, TRENCHING AND BACKFILLING

A. Verify existing underground utility locations before excavation is to begin. Perform all excavation to install underground circuiting and raceway systems indicated on the drawings or specified herein.

3.5 COORDINATION AND COOPERATION

A. Schedule the work, coordinate, and cooperate with all trades to avoid interferences, delays, and unnecessary work. See Section 01 30 00 - Administrative Requirements for coordination, scheduling, and RFI procedures and requirements.

B. Notify other trades of dedicated electrical space to ensure those spaces stay clear of pipes, duct work and other foreign systems.

3.6 OPERATION AND MAINTENANCE MANUALS AND INSTRUCTIONS

A. See Section 01 78 23 – Operations and Maintenance Data for Operation and Maintenance Manual submittals and format. Provide electrical equipment shop drawings, and additional shop and product drawings as required by other Division 26 individual specification sections. Refer to Section 01 30 00 - Administrative Requirements for additional information on submittal requirements.

B. See Section 01 77 00 – Closeout Procedures for training, demonstration, and instruction requirements.

3.7 ELECTRICAL ACCEPTANCE TESTS AND MANUFACTURERS CERTIFICATION

A. Refer to the individual specification sections and the Electrical Acceptance Testing section for equipment or system test requirements. Testing documentation shall be provided for reference at the time of final project review.

B. Where specified under the individual system specification sections, the systems shall be reviewed for compliance with these specifications, installation in accordance with the manufacturer's recommendations, and system operation by a representative of the manufacturer.

3.8 CONSTRUCTION OBSERVATION ASSISTANCE

A. Provide personnel to assist the Contracting Officer or their representative during all construction observation visits. Provide tools and equipment to demonstrate the system operation and provide access to equipment, including screwdrivers, wrenches, ladders, flashlights, circuit testing devices, meters, keys, etc.

B. Remove panelboard trims, motor control covers, device plates, junction box covers, etc. as directed for inspection of internal wiring. Turn over to the Government one set of keys for all lockable electrical equipment on the project. Accessible ceilings shall be removed as directed for inspection of equipment installed above ceilings.

C. Energize and de-energize circuits and equipment as directed. Demonstrate operation of equipment and systems as directed.

D. Provide authorized representatives of the manufacturers to demonstrate to the Contracting Officer compliance with the Contract Documents at a time designated by the Contracting Officer.

3.9 LOW VOLTAGE CABLE ROUTING

A. All low voltage, building control, and fire alarm cabling shall be run tight to structure, regardless of whether cables are above or below structural elements. Free-standing cables, conduits, or cable trays spanning open spaces or voids is prohibited. All cabling to be routed in areas with exposed ceilings, cloud ceilings, or any other areas where cabling will be visible to building occupants shall be routed inside conduit or cable trays and be hidden from view. Coordinate electrical, low voltage, building controls, and fire alarm to maintain uniform installation approach.

1. If any of these conditions are identified in the field, remove and reinstall cabling in accordance with these directions at no additional cost to the Contract.
2. If there are areas where cable routing cannot comply with these instructions, furnish a sketch identifying such areas, how the routing in indicated areas will differ from these instructions and obtain written approval from the Contracting Officer prior to installation.

B. Cabling and associated equipment, accessories, and specialties shall not be installed without first coordinating the installation of same with other trades. All uncoordinated cabling and other equipment installed that is determined by the Contracting Officer, the Government, or the Authority Having Jurisdiction (AHJ) to interfere with the proper installation and mounting of fire protection equipment, plumbing equipment, HVAC equipment, ceilings, or other architectural or structural systems or finishes shall be relocated at the Contractor's expense.

C. Stacking of cabling where it would cause an obstruction or restricted access path for egress or serviceability of equipment is prohibited.

3.10 RESTRICTIONS ON SURFACE MOUNTED CONDUIT AND DEVICES

A. New Construction: Unless otherwise noted on the drawings or specifications, all conduit shall be concealed and wall mounted devices recessed flush within walls. Surface mounted conduit and devices are prohibited.

B. Renovations: Unless otherwise noted on the drawings or specifications, all conduit shall be concealed and wall mounted devices recessed within existing walls. Contractors pricing to include cutting existing walls to install concealed conduit and flush wall mounted devices. Price to also include patching existing walls back to original condition. Surface mounted conduit and devices are prohibited.

END OF SECTION 26 00 50

SECTION 26 05 05 - SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that abandoned wiring and equipment directed to be abandoned-in-place (as opposed to abandoned and demolished) on drawings serve only abandoned facilities.

B. Demolition drawings are based on casual field observation and existing record documents. Contractor shall field-verify all existing conditions match design conditions before beginning work.

C. Report discrepancies to Contracting Officer before disturbing existing installation.

D. Beginning of demolition means installer accepts existing conditions.

3.2 PREPARATION

A. Disconnect electrical systems in walls, floors, and ceilings to be removed.

B. Coordinate utility service outages with utility company.

C. Provide temporary wiring and connections to maintain existing systems that are to remain in active service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.

D. Existing Electrical Service: For facilities where existing systems must remain energized during construction, maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

1. Obtain permission from Government at least 24 hours before partially or completely disabling system.
2. Coordinate with Government to verify that anticipated outage duration is acceptable prior to de-energizing systems.

E. Existing Fire Alarm System: Maintain existing system in service at all times until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.

1. Notify Government before partially or completely disabling system.
2. Notify local fire service.
3. Make notifications at least 24 hours in advance.

F. Fire Watch Requirements: If existing Fire Alarm System has to be removed during construction in a building that is occupied, a Fire Watch Plan shall be implemented.

1. A minimum of one person whose sole responsibility is to perform fire watch with no other duties or responsibilities will be required to walk through the entire premises 24/7 and shall be required to maintain a log of events and activities. This person will also be required to have at least one approved means to notify the fire department at any time.
2. All staff shall be informed of the fire watch and shall be instructed to be alert to possible fire situations.
3. Fire watch personnel shall be trained in the use of fire extinguishers, shall have access to all facility fire extinguishers, and know the fire extinguisher locations.
4. A tag of impairment shall be placed on each major component of the fire system. The tag of impairment signage shall state the following: "Fire protection system is impaired. Fire watch procedures are being performed". Major fire system locations shall have signage placements as follows:
    a. Sprinkler systems shall have a red tag placed on the system riser and fire department connection
    b. Hood suppression systems shall have a red tag placed on the manual pull station. and
    c. Fire alarm systems / other life safety systems shall have signage printed and placed on the annunciator and main fire alarm panel.
5. Notification of the fire watch condition shall be made within 24 hours to the insurance carrier and any applicable Authority Having Jurisdiction (AHJ).
6. Record of notification shall be forwarded to the Office of the Fire Marshal.

G. Existing Telephone/Data/Communications System: For facilities where existing systems must remain in service during construction (e.g., Fire Alarm, etc.), maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:

1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
2. PCB- and DEHP-containing lighting ballasts.
3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.

B. Remove abandoned wiring and associated junction boxes indicated for demolition to source of supply.

C. Remove exposed abandoned conduit indicated for demolition, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.

D. Disconnect abandoned outlets and remove devices. Demolish abandoned outlets if conduit servicing them is abandoned and demolished. Provide blank cover for abandoned outlets that are not demolished.

E. Disconnect and remove abandoned panelboards and distribution equipment indicated for demolition.

F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been demolished.

G. Disconnect and remove abandoned luminaires indicated for demolition. Remove brackets, stems, hangers, and other accessories associated with demolished fixtures.

H. Repair adjacent construction and finishes damaged during demolition and extension work.

I. Maintain access to existing electrical installations that remain active. Coordinate in-field conditions that interfere with accessibility of electrical installation with the Contracting Officer.

3.4 CLEANING AND REPAIR

A. Clean and repair existing materials and equipment that remain or that are to be reused, and provide touch-up paint to match new installation.

B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

C. Luminaires: Remove existing luminaires to remain for cleaning. Clean in accordance with luminaire manufacturer's instructions. At a minimum, use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts (where indicated on drawings), and broken lenses.

END OF SECTION 26 05 05

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SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Single conductor building wire.

B. Metal-clad cable.

C. Wiring connectors.

D. Electrical tape.

E. Oxide inhibiting compound.

F. Wire pulling lubricant.

G. Cable ties.

H. Firestop sleeves.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ASTM B3 - Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2024).

B. ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2023.

C. ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).

D. ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).

E. ASTM B800 - Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes - Annealed and Intermediate Tempers; 2005 (Reapproved 2021).

F. ASTM B801 - Standard Specification for Concentric-Lay-Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation; 2018 (Reapproved 2023).

G. ASTM D3005 - Standard Specification for Low-Temperature Resistant Vinyl Chloride Plastic Pressure-Sensitive Electrical Insulating Tape; 2024.

H. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

I. NECA 104 - Standard for Installing Aluminum Building Wire and Cable; 2012.

J. NECA 120 - Standard for Installing Armored Cable (AC) and Type Metal-Clad (MC) Cable; 2018.

K. NEMA WC 70 - Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.

L. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

M. UL 44 - Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.

N. UL 83 - Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.

O. UL 267 - Outline of Investigation for Wire-Pulling Compounds; Current Edition, Including All Revisions.

P. UL 486A-486B - Wire Connectors; Current Edition, Including All Revisions.

Q. UL 486C - Splicing Wire Connectors; Current Edition, Including All Revisions.

R. UL 486D - Sealed Wire Connector Systems; Current Edition, Including All Revisions.

S. UL 510 - Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.

T. UL 1569 - Metal-Clad Cables; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
3. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 CONDUCTOR AND CABLE APPLICATIONS

A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.

B. Provide single conductor building wire installed in raceway sized and configured to meet NEC requirements unless specifically otherwise indicated or permitted.

C. Nonmetallic-sheathed cable is not permitted.

D. Metal-clad cable is permitted only as follows:

1. Where not otherwise restricted, can use:
    a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
        1) Maximum Length: 6 feet.
    b. Where concealed in hollow stud walls, above accessible ceilings, and under raised floors for branch circuits up to 20 A.
    c. From the last junction box to the device being fed.
2. In addition to other applicable restrictions, do not use:
    a. Where exposed to damage.
    b. For damp, wet, or corrosive locations, unless provided with a PVC jacket listed as suitable for those locations.
    c. To feed panelboards.
    d. Routing from junction box to junction box.
    e. Areas with exposed ceilings, cloud ceilings or exposed walls.

2.2 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

A. Provide products that comply with requirements of NFPA 70.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Unless specifically indicated to be excluded, provide all conduit, boxes, wiring, connectors, etc. for a complete operating system.

D. Comply with NEMA WC 70.

E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.

F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.

G. Conductors for Grounding and Bonding: Also comply with Section 26 05 26.

H. Conductor Material:

1. Provide copper conductors except where aluminum conductors are specifically indicated or permitted for substitution. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
    a. Where aluminum conductors are substituted for copper, comply with the following:
        1) Size aluminum conductors to provide, when compared to copper sizes indicated, equivalent or greater ampacity and equivalent or less voltage drop.
        2) Increase size of raceways, boxes, wiring gutters, enclosures, etc. as required to accommodate aluminum conductors.
2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
3. Tinned Copper Conductors: Comply with ASTM B33.
4. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors recognized by ASTM B800 and compact stranded in accordance with ASTM B801 unless otherwise indicated.

I. Minimum Conductor Size:

1. Branch Circuits: 12 AWG.
    a. Exceptions:
        1) 20 A, 120 V circuits longer than 75 feet: 10 AWG, for voltage drop.
        2) 20 A, 120 V circuits longer than 150 feet: 8 AWG, for voltage drop.

J. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

K. Conductor Color Coding:

1. Color code conductors as indicated. Maintain consistent color coding throughout project.
2. Color Coding Method: Integrally colored insulation.
3. For New Construction Only:
    a. Color Code:
        1) 208Y/120 V, 3 Phase, 4 Wire System:
            (a) Phase A: Black.
            (b) Phase B: Red.
            (c) Phase C: Blue.
            (d) Neutral/Grounded: White.
        2) Equipment Ground, All Systems: Green.
        3) Travelers for 3-Way and 4-Way Switching: Pink.
    b. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction. Add phase tape where new wiring color is not able to be matched to existing wiring color coding.
    c. For control circuits, comply with manufacturer's recommended color code.

2.3 SINGLE CONDUCTOR BUILDING WIRE

A. Description: Single conductor insulated wire.

B. Conductor Stranding:

1. Feeders and Branch Circuits:
    a. Size 10 AWG and Smaller: Solid.
    b. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation:

1. Copper Building Wire: Type THHN/THWN or THHN/THWN-2.
    a. Installed Underground: Type XHHW-2.

2.4 METAL-CLAD CABLE

A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.

B. Conductor Stranding:

1. Size 10 AWG and Smaller: Solid.
2. Size 8 AWG and Larger: Stranded.

C. Insulation Voltage Rating: 600 V.

D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.

E. Grounding: Full-size integral equipment grounding conductor.

F. Armor: Steel, interlocked tape.

G. Provide PVC jacket applied over cable armor.

2.5 WIRING CONNECTORS

A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.

B. Connectors for Grounding and Bonding: Comply with Section 26 05 26.

C. Wiring Connectors for Splices and Taps:

1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.

D. Wiring Connectors for Terminations:

1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.

E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.

F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.

G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; for damp or wet applications, connector to be pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

H. Mechanical Connectors: Provide bolted type or set-screw type.

I. Compression Connectors: Provide circumferential type or hex type crimp configuration.

2.6 ACCESSORIES

A. Electrical Tape:

1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.
2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.

B. Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.

C. Wire Pulling Lubricant:

1. Listed and labeled as complying with UL 267.
2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
3. Suitable for use at installation temperature.

D. Cable Ties: Material and tensile strength rating suitable for application.

E. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for cables and roofing system to be installed; designed to accommodate existing penetrations where applicable. See Architectural drawings for penetration details.

F. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that work likely to damage wire and cable has been completed.

C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.

D. Verify that field measurements are as indicated.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Circuiting Requirements:

1. Unless dimensioned, circuit routing indicated is diagrammatic.
2. Arrange circuiting to minimize splices.
3. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.

B. Install products in accordance with manufacturer's instructions.

C. Perform work in accordance with NECA 1 (general workmanship).

D. Install aluminum conductors in accordance with NECA 104.

E. Install metal-clad cable (Type MC) in accordance with NECA 120.

F. Installation in Raceway:

1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
2. Pull all conductors and cables together into raceway at same time.

3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
4. Use suitable wire pulling lubricant, except when lubricant is not recommended by the manufacturer.

G. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.

H. Terminate cables using suitable fittings.

1. Metal-Clad Cable (Type MC):
   a. Use listed fittings.
   b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.

I. Install conductors with a minimum of 12 inches of slack at each outlet.

J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures. Adhere to accepted industry practices as described in ANSI/NECA 1-2015, Standard for Good Workmanship in Electrical Construction, and other ANSI-approved installation standards.

K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

L. Make wiring connections using specified wiring connectors.

1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
3. Do not remove conductor strands to facilitate insertion into connector.
4. Clean contact surfaces on conductors and connectors to suitably remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
5. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
6. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
7. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

N. Insulate ends of spare conductors using vinyl insulating electrical tape.

O. Field-Applied Color Coding: Where vinyl color coding electrical tape is used in lieu of integrally colored insulation as permitted in Part 2 under "Color Coding", apply half overlapping turns of tape at each termination and at each location conductors are accessible.

P. Identify conductors and cables in accordance with Section 26 05 53.

Q. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

R. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

END OF SECTION 26 05 19

SECTION 26 05 26 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Grounding and bonding requirements.

B. Conductors for grounding and bonding.

C. Connectors for grounding and bonding.

D. Ground bars.

E. Ground rod electrodes.

F. Ground enhancement material.

G. Ground access wells.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.

B. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings; 2022.

D. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 467 - Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.4 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.1 GROUNDING AND BONDING REQUIREMENTS

A. Do not use products for applications other than as permitted by NFPA 70 and product listing.

B. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.

C. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

D. Grounding Electrode System:

1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    a. Provide continuous grounding electrode conductors without splice or joint.
    b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
2. Metal Underground Water Pipe(s):
    a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
3. Metal In-Ground Support Structure:
    a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
4. Concrete-Encased Electrode:
    a. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
5. Ground Rod Electrode(s):
    a. Provide three electrodes in an equilateral triangle configuration unless otherwise indicated or required.
    b. Space electrodes not less than 10 feet from each other and any other ground electrode.
    c. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
    d. Provide ground enhancement material around electrode as required by conditions identified through resistivity testing. See Part 3 - Execution, Field Quality Control.
6. Ground Bar: Provide ground bar, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
    a. Ground Bar Size: 1/4 by 2 by 12 inches unless otherwise indicated or required.
    b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
    c. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

E. Service-Supplied System Grounding:

1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.

F. Grounding for Separate Building or Structure Supplied by Feeder(s) or Branch Circuits:

1. Provide grounding electrode system for each separate building or structure.
2. Provide equipment grounding conductor routed with supply conductors.
3. For each disconnecting means, provide grounding electrode conductor to connect equipment ground bus to grounding electrode system.
4. Do not make any connections and remove any factory-installed jumpers between neutral (grounded) conductors and ground.

G. Separately Derived System Grounding:

1. Separately derived systems include, but are not limited to:
   a. Transformers (except autotransformers such as buck-boost transformers).
   b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
   c. Generators, when neutral is switched in the transfer switch.
2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
6. Where the source and first disconnecting means are in separate enclosures, provide supply-side bonding jumper between source and first disconnecting means.

H. Bonding and Equipment Grounding:

1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.

2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.

I. Communications Systems Grounding and Bonding:

1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.

2.2 GROUNDING AND BONDING COMPONENTS

A. General Requirements:

1. Provide products listed, classified, and labeled as suitable for the purpose intended.
2. Provide products listed and labeled as complying with UL 467 where applicable.

B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:

1. Use insulated copper conductors unless otherwise indicated.
   a. Exceptions:
      1) Use bare copper conductors where installed underground in direct contact with earth.

C. Connectors for Grounding and Bonding:

1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.

D. Ground Bars:

1. Description: Copper rectangular ground bars with mounting brackets and insulators.
2. Size: As indicated.
3. Holes for Connections: As indicated or as required for connections to be made.

E. Ground Rod Electrodes:

1. Comply with NEMA GR 1.
2. Material: Copper-bonded (copper-clad) steel.
3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

F. Ground Enhancement Material:

1. Description: Factory-mixed conductive material designed for permanent and maintenance-free improvement of grounding effectiveness by lowering resistivity.

G. Ground Access Wells:

1. Description: Open bottom round or rectangular well with access cover for testing and inspection; suitable for the expected load at the installed location.
2. Size: As required to provide adequate access for testing and inspection, but not less than minimum size requirements specified.
3. Depth: As required to extend below frost line to prevent frost upheaval, but not less than 10 inches.
4. Cover: Factory-identified by permanent means with word "GROUND".

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle or bury horizontally in trench at least 30 inches (750 mm) deep in accordance with NFPA 70 or provide ground plates.

D. Make grounding and bonding connections using specified connectors.

1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.

E. Identify grounding and bonding system components in accordance with Section 26 05 53.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS except Section 4.

C. Perform inspections and tests listed in NETA ATS, Section 7.13.

D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.

E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

END OF SECTION 26 05 26

SECTION 26 05 29 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete equipment pads.

B. Section 05 50 00 - Metal Fabrications: Materials and requirements for fabricated metal supports.

C. Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.

D. Section 26 05 33.16 - Boxes for Electrical Systems: Additional support and attachment requirements for boxes.

E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems: Electrical systems and components subject to seismic restraint requirements.

F. Section 26 51 00 - Interior Lighting: Additional support and attachment requirements for interior luminaires.

G. Section 26 56 00 - Exterior Lighting: Additional support and attachment requirements for exterior luminaires.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. MFMA-4 - Metal Framing Standards Publication; 2004.

E. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Sequencing:

1. Do not install products on or provide attachment to concrete surfaces until concrete has cured; see Section 03 30 00.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
   a. NFPA 70.
   b. Requirements of Authority Having Jurisdiction (AHJ).
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported. Include consideration for vibration, equipment operation, and shock loads where applicable.
5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Do not use wire, chain, perforated pipe strap, or wood for permanent supports unless specifically indicated or permitted.
7. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
   c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Components for Vibration Isolation and/or Seismic Controls: See Section 26 05 48.

C. Materials for Metal Fabricated Supports: See Section 05 50 00.

D. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

E. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported, per box manufacturer's requirements.

F. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.
3. Channel Material:
   a. Indoor Dry Locations: Use painted steel, zinc-plated steel, or galvanized steel.
   b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel.

G. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

H. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.
2. Plastic and lead anchors are not permitted.
3. Powder-actuated fasteners are not permitted.
4. Hammer-driven anchors and fasteners are not permitted.
5. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) for compliance with applicable building code.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1.

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

E. Unless specifically indicated or approved by Contracting Officer, do not provide support from suspended ceiling support system or ceiling grid.

F. Unless specifically indicated or approved by Contracting Officer, do not provide support from roof deck.

G. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

H. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.

I. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Unless otherwise indicated, mount floor-mounted equipment on properly sized concrete pad 3 inches in height; see Section 03 30 00.
5. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

J. Conduit Support and Attachment: See Section 26 05 33.13 for additional requirements.

K. Box Support and Attachment: See Section 26 05 33.16 for additional requirements.

L. Interior Luminaire Support and Attachment: See Section 26 51 00 for additional requirements.

M. Exterior Luminaire Support and Attachment: See Section 26 56 00 for additional requirements.

N. Secure fasteners in accordance with manufacturer's recommended torque settings.

O. Remove temporary supports.

3.2 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Inspect support and attachment components for damage and defects.

C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

D. Correct deficiencies and replace damaged or defective support and attachment components.

END OF SECTION 26 05 29

SECTION 26 05 33.13 - CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Galvanized steel rigid metal conduit (RMC).

B. Galvanized steel electrical metallic tubing (EMT).

C. Rigid polyvinyl chloride (PVC) conduit.

1.2 RELATED REQUIREMENTS

A. Section 07 84 00 - Firestopping.

B. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

D. Section 26 05 44 - Sleeves And Sleeve Seals For Electrical Raceways And Cabling: Underground conduit penetrations of exterior wall.

E. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

F. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

1.3 REFERENCE STANDARDS

A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.

B. ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.

E. NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC); 2025.

F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

G. NEMA RN 1 - Polyvinyl-Chloride (PVC) Externally Coated Galvanized Rigid Steel Metal Conduit and Intermediate Metal Conduit; 2018.

H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Conduit; 2020.

I. NEMA TC 3 - Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.

J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

K. UL 6 - Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.

L. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

M. UL 514B - Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.

N. UL 651 - Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.

O. UL 797 - Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.

P. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

Q. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
5. Notify Contracting Officer of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.5 QUALITY ASSURANCE

A. Product Listing Organization Qualifications: Organization recognized by OSHA as Nationally Recognized Testing Laboratory (NRTL) and acceptable to Authority Having Jurisdiction (AHJ)

PART 2 PRODUCTS

2.1 CONDUIT APPLICATIONS

A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.

B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.

C. Underground:

1. Under Slab on Grade: Use rigid PVC conduit.
2. Exterior, Direct-Buried: Use rigid PVC conduit.
3. Where rigid polyvinyl chloride (PVC) conduit is provided, transition to Galvanized steel rigid metal conduit (RMC) six inches above grade where emerging from underground.
   a. Exception: Conduit serving communications systems may use rigid polyvinyl chloride (PVC) conduit above grade.

D. Concealed Within Masonry Walls: Use galvanized steel electrical metallic tubing (EMT).

E. Concealed Within Hollow Stud Walls: Use galvanized steel electrical metallic tubing (EMT).

F. Concealed Above Accessible Ceilings: Use galvanized steel electrical metallic tubing (EMT).

G. Interior, Damp or Wet Locations: Use galvanized steel electrical metallic tubing (EMT).

H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel electrical metallic tubing (EMT).

I. Exposed, Interior, Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC) .

1. Locations subject to physical damage include, but are not limited to:
   a. Where exposed below 8 feet, except within electrical and communication rooms or closets.

J. Exposed, Exterior: Use galvanized steel rigid metal conduit (RMC).

2.2 CONDUIT - GENERAL REQUIREMENTS

A. Comply with NFPA 70.

B. Provide conduit, fittings, supports, and accessories required for complete raceway system.

C. Provide products listed, classified, and labeled as suitable for purpose intended.

D. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.3 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.

B. Fittings:

1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.4 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.

B. Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use compression/gland or set-screw type.

2.5 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated,

Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.

B. Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.6 ACCESSORIES

A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.

B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.

C. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf.

D. Conduit Mechanical Seals:

1. Listed as complying with UL 514B.
2. Specifically designed for sealing conduit openings against water, moisture, gases, and dust.
3. Suitable for sealing around conductors/cables to be installed.

E. Sealing Systems for Concrete Penetrations:

1. SLEEVES
   a. Wall Sleeves:
      1) Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
      2) Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.
   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. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.
   d. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.
   e. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
   f. 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.

F. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required by roofing material manufacturers and installer to preserve integrity of roofing system

and maintain roof warranty; suitable for conduits and roofing system to be installed; designed to accommodate existing penetrations where applicable.

G. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that mounting surfaces are ready to receive conduits.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install conduit in accordance with NECA 1.

C. Galvanized Steel Rigid Metal Conduit (RMC): Install in accordance with NECA 101.

D. Rigid Polyvinyl Chloride (PVC) Conduit: Install in accordance with NECA 111.

E. Conduit Routing:

1. Unless dimensioned, conduit routing indicated is diagrammatic.
2. When conduit destination is indicated without specific routing, determine exact routing required.
3. Conceal conduits unless specifically indicated to be exposed.
4. Conduits in the following areas may be exposed, unless otherwise indicated:
   a. Electrical rooms.
   b. Mechanical equipment rooms.
   c. Within joists in areas with no ceiling.
5. Unless otherwise approved, do not route exposed conduits:
   a. Across floors.
   b. Across roofs. Where specifically permitted, must be routed in Galvanized Rigid Conduit unless specifically noted otherwise in writing.
   c. Across top of parapet walls.
   d. Across building exterior surfaces.
6. Conduits installed underground or embedded in concrete may be routed in shortest possible manner unless otherwise indicated. Route other conduits parallel or perpendicular to building structure and surfaces, following surface contours where practical.
7. Arrange conduit to maintain adequate headroom, clearances, and access.
8. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
9. Arrange conduit to provide no more than 150 feet between pull points.
10. Route conduits above water and drain piping where possible.
11. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
12. Maintain minimum clearance of 6 inches between conduits and piping for other systems.

13. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
    a. Heaters.
    b. Hot water piping.
    c. Flues.
14. Group parallel conduits in same area on common rack.

F. Conduit Support:

1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by Authority Having Jurisdiction (AHJ) ; see Section 26 05 29.
2. Provide required vibration isolation and/or seismic controls; see Section 26 05 48.
3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
5. Where conduit support intervals specified in NFPA 70 and NECA standards differ, comply with most stringent requirements.

G. Connections and Terminations:

1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
3. Use suitable adapters where required to transition from one type of conduit to another.
4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
5. Where spare conduits stub up through concrete floors and are not terminated in box or enclosure, provide threaded couplings equipped with threaded plugs set flush with finished floor.
6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
7. Secure joints and connections to provide mechanical strength and electrical continuity.

H. Penetrations:

1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
2. Make penetrations perpendicular to surfaces unless otherwise indicated.
3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
4. Conceal bends for conduit risers emerging above ground.
5. See Section 26 05 44 - Sleeves And Sleeve Seals For Electrical Raceways And Cabling for conduit penetrations through exterior wall below grade.
6. Where conduits penetrate waterproof membrane, seal as required by membrane manufacturer to maintain integrity of membrane.
7. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are

necessary, seal as indicated or as required by the assembly manufacturer to preserve integrity of roofing system and maintain roof warranty.

8. Provide metal escutcheon plates for conduit penetrations exposed to public view.
9. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 07 84 00.

I. Underground Installation:

1. Minimum Cover, Unless Otherwise Indicated or Required:
   a. Underground, Exterior: .
      1) Under Drives: 24 inches
      2) All Other Areas: 18 inches
   b. Under Slab on Grade: 12 inches to bottom of slab.
2. Provide underground warning tape along entire conduit length; see Section 26 05 53.

J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:

1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
3. Where conduits are subject to earth movement by settlement or frost.

K. Conduit Sealing:

1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
   a. Where conduits enter building from outside.
   b. Where service conduits enter building from underground distribution system.
   c. Where conduits enter building from underground.
   d. Where conduits may transport moisture to contact live parts.
2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:
   a. Where conduits pass from outdoors into conditioned interior spaces.
   b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.

L. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end.

M. Provide grounding and bonding; see Section 26 05 26.

N. Identify conduits; see Section 26 05 53.

3.3 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.

C. Correct deficiencies and replace damaged or defective conduits.

3.4 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.5 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

END OF SECTION 26 05 33.13

SECTION 26 05 33.16 - BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.

B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.

C. Boxes and enclosures for integrated power, data, and audio/video.

D. Boxes for hazardous (classified) locations.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.13 - Conduit for Electrical Systems:

1. Conduit bodies and other fittings.

C. Section 26 05 53 - Identification for Electrical Systems: Identification products and requirements.

D. Section 26 27 26 - Wiring Devices:

1. Wall plates.
2. Floor box service fittings.
3. Poke-through assemblies.
4. Additional requirements for locating boxes for wiring devices.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

D. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.

E. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).

F. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports; 2013 (Reaffirmed 2020).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

I. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

J. UL 508A - Industrial Control Panels; Current Edition, Including All Revisions.

K. UL 514A - Metallic Outlet Boxes; Current Edition, Including All Revisions.

L. UL 514C - Nonmetallic Outlet Boxes, Flush-Device Boxes, and Covers; Current Edition, Including All Revisions.

M. UL 1203 - Explosion-Proof and Dust-Ignition-Proof Electrical Equipment for Use in Hazardous (Classified) Locations; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
4. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
5. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
6. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Comply with requirements of NECA 1.

PART 2 PRODUCTS

2.1 BOXES

A. General Requirements:

1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
2. Provide all boxes, fittings, supports, and accessories required by product manufacturers and Reference Standards above in this section for a complete raceway system and to accommodate devices and equipment to be installed.
3. Provide products listed, classified, and labeled as suitable for the purpose intended.
4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified below and in the drawings.
5. Provide grounding terminals within boxes where equipment grounding conductors terminate.

B. Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:

1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
2. Use cast iron boxes or cast aluminum boxes for damp or wet locations and cast aluminum boxes for exterior locations unless otherwise indicated; furnish with compatible weatherproof gasketed covers.
3. Use suitable concrete type boxes where flush-mounted in concrete.
4. Use suitable masonry type boxes where flush-mounted in masonry walls.
5. Use raised covers suitable for the type of wall construction and device configuration.
6. Use shallow boxes where required to fit flush within the specific type of wall construction.
7. Do not use "through-wall" boxes designed for access from both sides of wall.
8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
10. Nonmetallic Boxes: Comply with NEMA OS 2, and list and label as complying with UL 514C. Install within Heated Building Thermal Envelopes only.
11. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required by manufacturer.
12. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
13. Minimum Box Size, Unless Otherwise Indicated:
    a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
    b. Communications Systems Outlets: 4 inch square by 2-1/8 inch (100 by 54 mm) trade size.
    c. Ceiling Outlets: 4 inch octagonal or square by 1-1/2 inch deep (100 by 38 mm) trade size.
14. Wall Plates: Comply with Section 26 27 26 - Wiring Devices.

C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:

1. Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
2. NEMA EN 10250 Environment Type, Unless Otherwise Indicated.
    a. Indoor Clean, Dry Locations: Type 1, painted steel.
    b. Outdoor Locations, Non-Corrosive Environment: Type 3R, painted steel.
    c. Outdoor Locations, Coastal, Chemical, or other Corrosive Environment: Type 4X, stainless steel.
3. Junction and Pull Boxes Larger Than 100 cubic inches:
    a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
4. Finish for Painted Steel Enclosures: Manufacturer's standard grey unless otherwise indicated.

D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may not be used.

E. Boxes for Hazardous (Classified) Locations: Listed and labeled as complying with UL 1203 for the classification of the installed location.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide separate boxes for emergency power and normal power systems.

E. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.

F. Box Supports:

1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the Authority Having Jurisdiction (AHJ)
2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

G. Install boxes plumb and level.

H. Flush-Mounted Boxes:

1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.

I. Install boxes as required to preserve insulation integrity.

J. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

K. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

L. Close unused box openings.

M. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

N. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION 26 05 33.16

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SECTION 26 05 44 - 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 A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

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. PVC-Pipe Sleeves: ASTM D1785, Schedule 40.

D. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

E. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

F. 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. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, 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.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
B. Standard: ASTM C1107/C1107M, 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].
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 sleees 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 26 05 44

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SECTION 26 05 48 - VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Vibration isolation requirements.

B. Seismic control requirements.

1. Includes requirements for seismic qualification of equipment not specified in this section.

C. Vibration-isolated equipment support bases.

D. Vibration isolators.

E. External seismic snubber assemblies.

F. Seismic restraint systems.

1.2 RELATED REQUIREMENTS

A. Section 01 45 33 - Code-Required Special Inspections and Procedures.

B. Section 03 30 00 - Cast-in-Place Concrete.

C. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.3 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

B. Seismic Restraint: Structural members or assemblies of members or manufactured elements specifically designed and applied for transmitting seismic forces between components and the seismic force-resisting system of the structure.

1.4 REFERENCE STANDARDS

A. ASCE 7 - Minimum Design Loads and Associated Criteria for Buildings and Other Structures; Most Recent Edition Cited by Referring Code or Reference Standard.

B. ASCE 19 - Structural Applications of Steel Cables for Buildings; 2016.

C. ASHRAE (HVACA) - ASHRAE Handbook - HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.

D. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2024a.

E. FEMA 413 - Installing Seismic Restraints for Electrical Equipment; 2004.

F. FEMA E-74 - Reducing the Risks of Nonstructural Earthquake Damage; 2012.

G. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. ICC-ES AC156 - Acceptance Criteria for Seismic Certification by Shake-Table Testing of Nonstructural Components; 2010, with Editorial Revision (2020).

I. MFMA-4 - Metal Framing Standards Publication; 2004.

J. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

K. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

L. SMACNA (SRM) - Seismic Restraint Manual Guidelines for Mechanical Systems; 2024.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Design Documents: Prepare and submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, details, and calculations.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets for products, including materials, fabrication details, dimensions, and finishes.

1. Vibration Isolators: Include rated load capacities and deflections; include information on color coding or other identification methods for spring element load capacities.
2. Seismic Controls: Include seismic load capacities.

D. Seismic Design Data:

1. Compile information on project-specific characteristics of actual installed electrical components necessary for determining seismic design forces required to design appropriate seismic controls, including but not limited to the following.
   a. Component operating weight and center of gravity.
   b. Component elevation in the building in relation to the roof elevation (z/h).
   c. Component importance factor (Ip).
   d. For distributed systems, component materials and connection methods.
   e. Component amplification factor (ap) and component response modification factor (Rp), determined in accordance with ASCE 7 tables.
   f. Applicability of overstrength factor (for certain anchorage in concrete and masonry).
2. Include structural calculations, stamped or sealed by seismic controls designer, demonstrating suitability of seismic controls for seismic design forces.

E. Certification for seismically qualified equipment; identify basis for certification.

F. Evaluation Reports: For products specified as requiring evaluation and recognition by a qualified evaluation service, provide current evaluation reports.

G. Manufacturer’s detailed field testing and inspection procedures.

H. Field quality control test reports.

1.6 QUALITY ASSURANCE

A. Comply with NFPA 70.

B. Comply with applicable building code.

C. Seismic Controls Designer Qualifications: Registered professional engineer licensed in the State in which the Project is located and with minimum five years experience designing seismic restraints for nonstructural components.

1. Designer may be employed by the manufacturer of the seismic restraint products.

PART 2 PRODUCTS

2.1 VIBRATION ISOLATION REQUIREMENTS

A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.

B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:

C. General Requirements:

1. Select vibration isolators to provide required static deflection.
2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.
3. Select seismic type vibration isolators to comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
4. Select vibration isolators for outdoor equipment to comply with wind design requirements.
5. Select vibration-isolated equipment support bases and associated vibration isolators to provide minimum 2-inch operating clearance beneath base unless otherwise indicated.

D. Equipment Isolation:

1. Transformers:
   a. Specified vibration isolators are in addition to any factory-installed internal core and coil assembly vibration isolators unless otherwise indicated.
   b. Floor-Mounted Transformers, Nonseismic Applications: Use resilent material isolator pads, resilient material isolator mounts, or open (unhoused) spring isolators.
   c. Floor-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts or seismic type restrained spring isolators.
   d. Suspended Transformers, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
   e. Suspended Transformers, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
   f. Wall-Mounted Transformers, Nonseismic Applications: Use resilient material isolator mounts.
   g. Wall-Mounted Transformers, Seismic Applications: Use seismic type resilient material isolator mounts.
   h. Minimum Static Deflection:
      1) Transformers Mounted on Grade-Level Slabs: 0.25 inch deflection unless otherwise indicated.
      2) Transformers Mounted at Above-Grade Levels: 0.5 inch deflection unless otherwise indicated.

2. Engine Generators:
    a. Specified vibration isolators are in addition to any factory-installed internal vibration isolators between generator set and integral base unless otherwise indicated; obtain generator set manufacturer approval of applied vibration isolation.
    b. Nonseismic Applications, Isolators Not Located Below Sub-Base Fuel Tank: Use housed spring isolators or restrained spring isolators.
    c. Nonseismic Applications, Isolators Located Below Sub-Base Fuel Tank: Use restrained spring isolators.
    d. Seismic Applications: Use seismic type restrained spring isolators.
    e. Provide vibration-isolated concrete inertia bases where equipment is not designed to be point loaded.
    f. Minimum Static Deflection:
        1) Generators Mounted on Grade-Level Slabs: 1 inch deflection unless otherwise indicated.
        2) Generators Mounted at Above-Grade Levels: 2 inch deflection unless otherwise indicated.

E. Conduit Isolation:
1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
    a. Minimum Length: 3 feet unless otherwise indicated.
2. Vibration Isolators:
    a. Provide vibration isolators for conduit supports:
        1) Located within 50 feet of connected vibration-isolated equipment where flexible connection to equipment is not possible.
    b. Minimum Static Deflection:
        1) First Three Supports Closest to Isolated Equipment: Same as static deflection of equipment; maximum of 2 inch deflection required.
        2) Remainder of Supports: 0.75 inch deflection unless otherwise indicated.
    c. Suspended Conduits, Nonseismic Applications: Use resilient material isolator hangers, spring isolator hangers, or combination resilient material/spring isolator hangers.
    d. Suspended Conduits, Seismic Applications: Use seismic type resilient material isolator hangers, seismic type spring isolator hangers, or seismic type combination resilient material/spring isolator hangers.
    e. Use modular seal or approved resilient material where vibration-isolated conduits penetrate building elements (e.g., walls, floors) arranged to prevent vibration transmission to structure.

2.2 SEISMIC CONTROL REQUIREMENTS

A. Design and provide electrical component restraints, supports, and attachments suitable for seismic loads determined in accordance with applicable codes, as well as gravity and operating loads and other structural design considerations of the installed location. Consider wind loads for outdoor electrical components.

B. Seismic Design Criteria: As indicated on drawings.

C. Component Importance Factor (Ip): Electrical components to be assigned a component importance factor (Ip) of 1.5 unless otherwise indicated.

D. Seismic Qualification of Equipment:

1. Provide special certification for electrical equipment furnished under other sections and assigned a component importance factor (Ip) of 1.5, certifying that equipment will remain operable following a design level earthquake.
2. Seismic qualification to be by shake table testing in accordance with recognized testing standard procedure, such as ICC-ES AC156, acceptable to authorities having jurisdiction.
3. Notify Contracting Officer and obtain direction where mounting restrictions required by conditions of seismic certification conflict with specified requirements.
4. Seismically qualified equipment to be furnished with factory-installed labels referencing certificate of compliance and associated mounting restrictions.

E. Seismic Restraints:

1. Provide seismic restraints for electrical components except where exempt according to applicable codes and specified seismic design criteria, as approved by authorities having jurisdiction.
2. Seismic Restraint Exemptions:
   a. Exemptions for Seismic Design Category D, E, and F:
      1) Discrete electrical components that are positively attached to the structure where either of the following apply:
         (a) The component weighs 400 pounds or less, has a center of mass located 4 feet or less above the adjacent floor level, flexible connections are provided between the component and associated ductwork, piping, and conduit, and the component importance factor (Ip) is 1.0.
         (b) The component weighs 20 pounds or less or, in the case of a distributed system, 5 pounds per foot or less.
   b. Conduit, Cable Tray, and Raceway Exemptions, All Seismic Design Categories:
      1) Raceways with component importance factor (Ip) of 1.0 where flexible connections are provided between cable tray or raceway and associated components, where cable tray or raceway is positively attached to the structure, and where one of the following apply:
         (a) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 3/8 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.
         (b) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 200 pounds or less.
         (c) Trapeze supported conduits, cable trays, or raceways with trapeze assemblies using 1/2 inch diameter rod hangers not exceeding 24 inches in

length from support point connection to the supporting structure, and the total weight supported by any single trapeze is 100 pounds or less.

(d) Hanger supported conduits, cable trays, or raceways with individual rod hangers 3/8 inch or 1/2 inch in diameter not exceeding 12 inches in length from support point connection to the supporting structure, and the total weight supported by any single rod is 50 pounds or less.

2) Conduits less than 2-1/2 inch trade size.

c. Lighting Exemptions, All Seismic Design Categories:

1) Suspended luminaires where attachments are designed to accommodate 1.4 times the operating weight acting in both the vertical and horizontal directions and connections to structure allow for 360 degree range of motion in the horizontal plane; arrange to prevent impact between luminaires and the structure or other nonstructural components.

2) Lay-in luminaires weighing less than 56 pounds secured to ceiling grid and provided with safety wires in accordance with ASTM E580/E580M.

3. Comply with applicable general recommendations of the following, where not in conflict with applicable codes, seismic design criteria, or other specified requirements:
   a. ASHRAE (HVACA).
   b. FEMA 413.
   c. FEMA E-74.
   d. SMACNA (SRM).
4. Seismic restraint capacities to be verified by a Nationally Recognized Testing Laboratory (NRTL) or certified by an independent third-party registered professional engineer acceptable to authorities having jurisdiction.
5. Seismic Type Vibration Isolators:
   a. Comply with seismic design requirements, including conditions of equipment seismic certification where applicable.
6. External Seismic Snubber Assemblies:
   a. Provide quantity and arrangement of external seismic snubber assemblies as required to restrain equipment in all directions (both lateral and vertical).
   b. Do not use external seismic snubber assemblies that restrain equipment only in one or more lateral directions (but not vertical) except where uplift forces are zero or are addressed by other restraints.
7. Seismic Restraint Systems:
   a. Except where otherwise restricted, use of either cable or rigid restraints is permitted.
   b. Use only cable restraints to restrain vibration-isolated electrical components, including distributed systems.
   c. Use only one restraint system type for a given electrical component or distributed system (e.g., conduit, cable tray) run; mixing of cable and rigid restraints on a given component/run is not permitted.
   d. Size restraint elements, including anchorage, to resist seismic loads as necessary to restrain electrical component in all lateral directions; consider bracket geometry in anchor load calculations.

e. Use rod stiffener clips to attach bracing to hanger rods as required to prevent rod buckling from vertical (upward) compressive load introduced by cable or rigid restraints loaded in tension, in excess of downward tensile load due to supported electrical component weight.
f. Select hanger rods and associated anchorage as required to accommodate vertical (downward) tensile load introduced by rigid restraints loaded in compression, in addition to downward tensile load due to supported electrical component weight.
g. Clevis hangers may only be used for attachment of transverse restraints; do not use for attachment of longitudinal restraints.
h. Where seismic restraints are attached to clevis hangers, provide clevis bolt reinforcement accessory to prevent clevis hanger deformation.
i. Do not introduce lateral loads on open bar joist chords or the weak axis of beams, or loads in any direction at other than panel points unless approved by project Structural Engineer of Record.

F. Seismic Attachments:

1. Attachments to be bolted, welded, or otherwise positively fastened without consideration of frictional resistance produced by the effects of gravity.
2. Post-Installed Concrete and Masonry Anchors: Evaluated and recognized by ICC Evaluation Service, LLC (ICC-ES) or qualified evaluation service acceptable to authorities having jurisdiction for compliance with applicable building code, and qualified for seismic applications; concrete anchors to be qualified for installation in both cracked and uncracked concrete.
3. Do not use power-actuated fasteners.
4. Do not use friction clips (devices that rely on mechanically applied friction to resist loads). Beam clamps may be used for supporting sustained loads where provided with restraining straps.
5. Comply with anchor minimum embedment, minimum spacing, minimum member thickness, and minimum edge distance requirements.
6. Concrete Housekeeping Pads:
   a. Increase size of pad as required to comply with anchor requirements.
   b. Provide pad reinforcement and doweling to ensure integrity of pad and connection and to provide adequate load path from pad to supporting structure.

G. Seismic Interactions:

1. Include provisions to prevent seismic impact between electrical components and other structural or nonstructural components.
2. Include provisions such that failure of a component, either essential or nonessential, does not cause the failure of an essential component.
3. Comply with minimum clearance requirements between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs.

H. Seismic Relative Displacement Provisions:

1. Use suitable fittings or flexible connections to accommodate:

a. Relative displacements at connections between components, including distributed systems (e.g., conduit, cable tray); do not exceed load limits for equipment utility connections.
b. Relative displacements between component supports attached to dissimilar parts of structure that may move differently during an earthquake.
c. Design displacements at seismic separations.
d. Anticipated drifts between floors.

2. Include provisions to prevent interruption of utility service due to seismic displacements.

2.3 VIBRATION-ISOLATED EQUIPMENT SUPPORT BASES

A. Vibration-Isolated Structural Steel Bases:

1. Description: Engineered structural steel frames with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.

B. Vibration-Isolated Concrete Inertia Bases:

1. Description: Concrete-filled engineered steel forms with integral mounting provisions for vibration isolators, sized and configured for mounting of equipment.
2. Minimum Base Depth: 6 inches.
3. Minimum Base Mass (Including Concrete): 1.5 times weight of supported equipment.
4. Concrete Reinforcement: Welded or tied reinforcing bars running both ways in a single layer.
5. Concrete: Filled on site with minimum 3000 psi concrete in accordance with Section 03 30 00.

2.4 VIBRATION ISOLATORS

A. General Requirements:

1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
2. Spring Elements for Spring Isolators:
a. Color code or otherwise identify springs to indicate load capacity.
b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.
e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
f. Selected to function without undue stress or overloading.
3. Seismic Snubbing Elements for Seismic Isolators:
a. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
b. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

B. Vibration Isolators for Nonseismic Applications:

1. Resilient Material Isolator Pads:

a. Description: Single or multiple layer pads utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material.
b. Pad Thickness: As required for specified minimum static deflection; minimum 0.25 inch thickness.
c. Multiple Layer Pads: Provide bonded, galvanized sheet metal separation plate between each layer.

2. Resilient Material Isolator Mounts, Non-seismic:
   a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material; fail-safe type.
3. Open (Unhoused) Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) without a housing.
   b. Bottom Load Plate: Nonskid, molded, elastomeric isolator material or steel with nonskid elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
4. Housed Spring Isolators:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing.
   b. Furnished with integral elastomeric snubbing elements, nonadjustable type, for limiting equipment movement and preventing metal-to-metal contact between housing elements.
   c. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   d. Furnished with integral leveling device for positioning and securing supported equipment.
5. Restrained Spring Isolators, Non-seismic:
   a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop.
   b. Bottom Load Plate: Steel with nonskid, elastomeric isolator pad with provisions for bolting to supporting structure as required.
   c. Furnished with integral leveling device for positioning and securing supported equipment.
   d. Provides constant free and operating height.
6. Resilient Material Isolator Hangers, Non-seismic:
   a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the lower hanger rod connection.
7. Spring Isolator Hangers, Non-seismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

8. Combination Resilient Material/Spring Isolator Hangers, Non-seismic:
a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) or fiberglass isolator material for the upper hanger rod connection.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

C. Vibration Isolators for Seismic Applications:

1. Resilient Material Isolator Mounts, Seismic:
a. Description: Mounting assemblies for bolting equipment to supporting structure utilizing elastomeric (e.g., neoprene, rubber) isolator material; specifically designed and rated for seismic applications with integral snubbing in all directions.

2. Restrained Spring Isolators, Seismic:
a. Description: Isolator assembly consisting of single or multiple free-standing, laterally stable steel spring(s) in series with elastomeric (e.g., neoprene, rubber) isolator material within a metal housing designed to prevent movement of supported equipment above an adjustable vertical limit stop; specifically designed and rated for seismic applications with integral snubbing in all directions.
b. Bottom Load Plate: Steel with provisions for bolting to supporting structure as required.
c. Furnished with integral leveling device for positioning and securing supported equipment.
d. Provides constant free and operating height.

3. Resilient Material Isolator Hangers, Seismic:
a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing elastomeric (e.g., neoprene, rubber) isolator material for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.

4. Spring Isolator Hangers, Seismic:
a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

5. Combination Resilient Material/Spring Isolator Hangers, Seismic:

a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) for the lower hanger rod connection and elastomeric (e.g., neoprene, rubber) isolator material for the upper hanger rod connection; specifically designed and rated for seismic applications with vertical limit stop to prevent upward travel of hanger rod and cushion impact.
b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

2.5 EXTERNAL SEISMIC SNUBBER ASSEMBLIES

A. Description: Steel snubbing assemblies designed for external attachment to both equipment and supporting structure that, as part of a complete system, restrain equipment motion in all directions during a seismic event while maintaining vibration isolation during normal operation.

B. Seismic Snubbing Elements:

1. Air Gap: Between 0.125 inches and 0.25 inches unless otherwise indicated.
2. Points of Contact: Cushioned with resilient material, minimum 0.25 inch thick; capable of being visually inspected for damage and replaced.

2.6 SEISMIC RESTRAINT SYSTEMS

A. Description: System components and accessories specifically designed for field assembly and attachment of seismic restraints.

B. Cable Restraints:

1. Comply with ASCE 19.
2. Cables: Pre-stretched, galvanized steel wire rope with certified break strength.
3. Cable Connections: Use only swaged end fittings. Cable clips and wedge type end fittings are not permitted in accordance with ASCE 19.
4. Use protective thimbles for cable loops where potential for cable damage exists.

C. Rigid Restraints: Use MFMA-4 steel channel (strut), steel angle, or steel pipe for structural element; suitable for both compressive and tensile design loads.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as shown on the drawings.

B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.

C. Verify that conditions are satisfactory for installation prior to starting work.

3.2 CODE-REQUIRED SPECIAL INSPECTIONS

A. Arrange work to accommodate tests and/or inspections performed by Special Inspection Agency employed by Government or Contracting Officer in accordance with Section 01 45 33 and statement of special inspections as required by applicable building code.

B. Frequency of Special Inspections: Where special inspections are designated as continuous or periodic, arrange work accordingly.
   1. Continuous Special Inspections: Special Inspection Agency to be present in the area where the work is being performed and observe the work at all times the work is in progress.
   2. Periodic Special Inspections: Special Inspection Agency to be present in the area where work is being performed and observe the work part-time or intermittently and at the completion of the work.

C. Seismic special inspections include, but are not limited to:
   1. Seismically Qualified Equipment: Verification that label, anchorage, and mounting comply with certificate of compliance.
   2. Anchorage of electric equipment for emergency and standby power systems for Seismic Design Categories C, D, E, and F; periodic inspection.
   3. Installation and anchorage of vibration isolation systems for Seismic Design Categories C, D, E, and F where Contract Documents require a nominal clearance of 1/4 inch or less between equipment support frame and seismic restraint; periodic inspection.
   4. Verification of required clearances between electrical equipment, distribution systems, and associated supports and fire protection sprinkler system drops and sprigs for Seismic Design Categories C, D, E, and F; periodic inspection.

D. Prior to starting work, Contractor to submit written statement of responsibility to authorities having jurisdiction and to Government acknowledging awareness of special requirements contained in the statement of special inspections.

E. Special Inspection Agency services do not relieve Contractor from performing inspections and testing specified elsewhere.

3.3 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).

C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.

D. Secure fasteners according to manufacturer's recommended torque settings.

E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.

F. Vibration Isolation Systems:
   1. Vibration-Isolated Equipment Support Bases:
      a. Provide specified minimum clearance beneath base.
   2. Spring Isolators:
      a. Position equipment at operating height; provide temporary blocking as required.
      b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.

c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.

3. Isolator Hangers:
   a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
   b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
4. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
5. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
6. Adjust isolators to be free of isolation short circuits during normal operation.
7. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

G. Seismic Controls:

1. Provide specified snubbing element air gap; remove any factory-installed spacers, debris or other obstructions.
2. Use only specified components, anchorage, and hardware evaluated by seismic design. Comply with conditions of seismic certification where applicable.
3. Where mounting hole diameter exceeds bolt diameter by more than 0.125 inch, use epoxy grout, elastomeric grommet, or welded washer to reduce clearance to 0.125 inch or less.
4. Equipment with Sheet Metal Housings:
   a. Use Belleville washers to distribute stress over a larger surface area of the sheet metal connection interface as approved by manufacturer.
   b. Attach additional steel as approved by manufacturer where required to transfer loads to structure.
   c. Where mounting surface is irregular, do not shim housing; reinforce housing with additional steel as approved by manufacturer.
5. Concrete Housekeeping Pads:
   a. Size in accordance with seismic design to meet anchor requirements.
   b. Install pad reinforcement and doweling in accordance with seismic design to ensure integrity of pad and associated connection to slab.
6. Seismic Restraint Systems:
   a. Do not attach seismic restraints and gravity supports to dissimilar parts of structure that may move differently during an earthquake.
   b. Install restraints within permissible angles in accordance with seismic design.
   c. Install cable restraints straight between component/run and structural attachment; do not bend around other nonstructural components or structural elements.
   d. Install cable restraints for vibration-isolated components slightly slack to prevent short-circuiting of isolation.
   e. Install hanger rod stiffeners where indicated using only specified clamps; do not weld stiffeners to hanger rod.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect vibration isolation and/or seismic control components for damage and defects.

C. Provide services of a manufacturer's authorized representative for vibration isolation systems and seismic controls to observe installation and assist in inspection and testing. Include manufacturer's detailed testing and inspection procedures and field reports with submittals.

D. Vibration Isolation Systems:

1. Verify isolator static deflections.
2. Verify required clearance beneath vibration-isolated equipment support bases.
3. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

E. Seismic Controls:

1. Verify snubbing element air gaps.

F. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

END OF SECTION 26 05 48

SECTION 26 05 53 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical identification requirements.

B. Identification nameplates and labels.

C. Wire and cable markers.

D. Underground warning tape.

E. Warning signs and labels.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.

B. Section 26 27 26 - Wiring Devices - Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.3 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. UL 969 - Marking and Labeling Systems; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.1 IDENTIFICATION REQUIREMENTS

A. Identification for Equipment:

1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
   a. Switchboards:
      1) Identify ampere rating.
      2) Identify voltage and phase.
      3) Identify power source and circuit number. Include location when not within sight of equipment.
      4) Use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
   b. Panelboards:
      1) Identify ampere rating.
      2) Identify voltage and phase.
      3) Identify power source and circuit number. Include location when not within sight of equipment.
      4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
      5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.

c. Transformers:
1) Identify kVA rating.
2) Identify voltage and phase for primary and secondary.
d. Enclosed switches, circuit breakers, and motor controllers:
1) Identify voltage and phase.
e. Transfer Switches:
1) Identify voltage and phase.
2) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.

2. Service Equipment:
a. Use identification nameplate to identify each service disconnecting means.
3. Emergency System Equipment:
a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
b. Use identification nameplate at each piece of service equipment to identify type and location of on-site emergency power sources.
4. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
a. Service equipment.
b. Industrial control panels.
c. Motor control centers.
d. Elevator control panels.
e. Industrial machinery.
6. Arc Flash Hazard Warning Labels: Use warning labels to identify arc flash hazards for electrical equipment, such as switchboards, panelboards, industrial control panels, meter socket enclosures, and motor control centers that are likely to require examination, adjustment, servicing, or maintenance while energized.

B. Identification for Conductors and Cables:

1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
3. Use underground warning tape to identify direct buried cables.

C. Identification for Devices:

1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
2. Use identification label to identify fire alarm system devices.
3. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
a. For receptacles in public areas, provide identification on inside surface of wallplate.

D. Identification for Luminaires:

1. Use permanent red dot on luminaire frame to identify luminaires connected to emergency power system.

2.2 IDENTIFICATION NAMEPLATES AND LABELS

A. Identification Nameplates:

1. Materials:
   a. Indoor Clean, Dry Locations: Use plastic nameplates.
   b. Outdoor Locations: Use plastic, stainless steel, or aluminum nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Stainless Steel Nameplates: Minimum thickness of 1/32 inch; engraved or laser-etched text.
4. Aluminum Nameplates: Anodized; minimum thickness of 1/32 inch; engraved or laser-etched text.
5. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.

B. Identification Labels:

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

C. Format for Equipment Identification:

1. Minimum Size: 1 inch by 2.5 inches.
2. Legend:
   a. System designation where applicable:
      1) Emergency Power System: Identify with text "EMERGENCY".
      2) Fire Alarm System: Identify with text "FIRE ALARM".
   b. Equipment designation or other approved description.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height:
   a. System Designation: 1 inch.
   b. Equipment Designation: 1/4 inch.
5. Color:
   a. Normal Power System: White text on black background.
   b. Emergency Power System: White text on red background.

D. Format for Receptacle Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Power source and circuit number or other designation indicated.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.

5. Color: Black text on clear background.

E. Format for Fire Alarm Device Identification:

1. Minimum Size: 3/8 inch by 1.5 inches.
2. Legend: Designation indicated and device zone or address.
3. Text: All capitalized unless otherwise indicated.
4. Minimum Text Height: 3/16 inch.
5. Color: Red text on white background.

2.3 WIRE AND CABLE MARKERS

A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.

B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.

C. Legend: Power source and circuit number or other designation indicated.

D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.

E. Minimum Text Height: 1/8 inch.

F. Color: Black text on white background unless otherwise indicated.

2.4 UNDERGROUND WARNING TAPE

A. Materials: Use non-detectable type polyethylene tape suitable for direct burial, unless otherwise indicated.

B. Non-detectable Type Tape: 6 inches wide, with minimum thickness of 4 mil.

C. Legend: Type of service, continuously repeated over full length of tape.

2.5 WARNING SIGNS AND LABELS

A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.

B. Warning Signs:

1. Materials:
   a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
   b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.
3. Minimum Size: 7 by 10 inches unless otherwise indicated.

C. Warning Labels:

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
3. Minimum Size: 2 by 4 inches unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:

1. Surface-Mounted Equipment: Enclosure front.
2. Flush-Mounted Equipment: Inside of equipment door.
3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
4. Elevated Equipment: Legible from the floor or working platform.
5. Branch Devices: Adjacent to device.
6. Interior Components: Legible from the point of access.
7. Conductors and Cables: Legible from the point of access.
8. Devices: Outside face of cover.

C. Install identification products centered, level, and parallel with lines of item being identified.

D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.

E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.

F. Install underground warning tape above buried lines with one tape per trench at 3 inches below finished grade.

G. Secure rigid signs using stainless steel screws.

H. Mark all handwritten text, where permitted, to be neat and legible.

END OF SECTION 26 05 53

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SECTION 26 05 73 - POWER SYSTEM STUDIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Short-circuit study.

B. Arc flash and shock risk assessment.

1. Includes arc flash hazard warning labels.

C. Criteria for the selection and adjustment of equipment and associated protective devices not specified in this section, as determined by studies to be performed.

1.2 RELATED REQUIREMENTS

A. Section 26 05 53 - Identification for Electrical Systems: Additional requirements for arc flash hazard warning labels.

1.3 REFERENCE STANDARDS

A. ANSI Z535.4 - American National Standard for Product Safety Signs and Labels; 2023.

B. IEEE 141 - IEEE Recommended Practice for Electric Power Distribution for Industrial Plants; 1993 (Reaffirmed 1999).

C. IEEE 242 - IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems; 2001, with Errata (2003).

D. IEEE 399 - IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis; 1997.

E. IEEE 551 - IEEE Recommended Practice for Calculating Short-Circuit Currents in Industrial and Commercial Power Systems; 2006.

F. IEEE 1584 - IEEE Guide for Performing Arc-Flash Hazard Calculations; 2018, with Errata (2019).

G. NEMA MG 00001 - Motors and Generators; 2024.

H. NETA ATS - Acceptance Testing Specifications for Electrical Power Equipment and Systems; 2017.

I. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

J. NFPA 70E - Standard for Electrical Safety in the Workplace; 2024.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work to provide equipment and associated protective devices complying with criteria for selection and adjustment, as determined by studies to be performed.
2. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:

1. Submit study reports prior to or concurrent with product submittals.
2. Do not order equipment until matching study reports and product submittals have both been evaluated by Contracting Officer.
3. Verify naming convention for equipment identification prior to creation of final drawings, reports, and arc flash hazard warning labels (where applicable).

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Study reports, stamped or sealed and signed by study preparer.

C. Product Data: In addition to submittal requirements specified in other sections, include manufacturer's standard catalog pages and data sheets for equipment and protective devices indicating information relevant to studies.

1. Where required, include characteristic time-current trip curves for protective devices.
2. Clearly indicate whether proposed short circuit current ratings are fully rated or, where acceptable, series rated systems.
3. Identify modifications made in accordance with studies that:
   a. Can be made at no additional cost to Government.
   b. As submitted will involve a change to the contract sum.

D. Arc Flash Hazard Warning Label Samples: One of each type and legend specified.

E. Site-specific arc flash hazard warning labels.

F. Certification that field adjustable protective devices have been set in accordance with requirements of studies.

1.6 POWER SYSTEM STUDIES

A. Scope of Studies:

1. Except where study descriptions below indicate exclusions, analyze system at each bus from primary protective devices of utility source down to each piece of equipment involved, including parts of system affecting calculations being performed (e.g. fault current contribution from motors).
2. Include in analysis alternate sources and operating modes (including known future configurations) to determine worst case conditions.
   a. Known Operating Modes:
      1) Utility as source.

B. General Study Requirements:

1. Comply with NFPA 70.
2. Perform studies utilizing computer software complying with specified requirements; manual calculations are not permitted.

C. Data Collection:

1. Compile information on project-specific characteristics of actual installed equipment, protective devices, feeders, etc. as necessary to develop single-line diagram of electrical distribution system and associated input data for use in system modeling.

a. Utility Source Data: Include primary voltage, maximum and minimum three-phase and line-to-ground fault currents, impedance, X/R ratio, and primary protective device information.
   1) Obtain up-to-date information from Utility Company.
b. Motors: Include manufacturer/model, type (e.g. induction, synchronous), horsepower rating, voltage rating, full load amps, and locked rotor current or NEMA MG 00001 code letter designation.
c. Protective Devices:
   1) Circuit Breakers: Include manufacturer/model, type (e.g. thermal magnetic, electronic trip), frame size, trip rating, voltage rating, interrupting rating, available field-adjustable trip response settings, and features (e.g. zone selective interlocking).
   2) Fuses: Include manufacturer/model, type/class (e.g. Class J), size/rating, and speed (e.g. time delay, fast acting).
d. Protective Relays: Include manufacturer/model, type, settings, current/potential transformer ratio, and associated protective device.
e. Conductors: Include feeder size, material (e.g. copper, aluminum), insulation type, voltage rating, number per phase, raceway type, and actual length.

D. Short-Circuit Study:

1. Comply with IEEE 551 and applicable portions of IEEE 141, IEEE 242, and IEEE 399.
2. For purposes of determining equipment short circuit current ratings, consider conditions that may result in maximum available fault current, including but not limited to:
   a. Maximum utility fault currents.
   b. Maximum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).
3. For each bus location, calculate the maximum available three-phase bolted symmetrical and asymmetrical fault currents. For grounded systems, also calculate the maximum available line-to-ground bolted fault currents.

E. Arc Flash and Shock Risk Assessment:

1. Comply with NFPA 70E.
2. Perform incident energy and arc flash boundary calculations in accordance with IEEE 1584 (as referenced in NFPA 70E Annex D), where applicable.
3. Analyze alternate scenarios considering conditions that may result in maximum incident energy, including but not limited to:
   a. Maximum and minimum utility fault currents.
   b. Maximum and minimum motor contribution.
   c. Known operating modes (e.g. utility as source, generator as source, utility/generator in parallel, bus tie breaker open/close positions).

F. Study Reports:

1. General Requirements:
   a. Identify date of study and study preparer.
   b. Identify study methodology and software product(s) used.

c. Identify scope of studies, assumptions made, implications of possible alternate scenarios, and any exclusions from studies.
d. Identify base used for per unit values.
e. Include single-line diagram and associated input data used for studies; identify buses on single-line diagram as referenced in reports, and indicate bus voltage.
f. Include conclusions and recommendations.

2. Short-Circuit Study:
   a. For each scenario, identify at each bus location:
      1) Calculated maximum available symmetrical and asymmetrical fault currents (both three-phase and line-to-ground where applicable).
      2) Fault point X/R ratio.
      3) Associated equipment short circuit current ratings.
   b. Identify locations where the available fault current exceeds the equipment short circuit current rating, along with recommendations.
3. Arc Flash and Shock Risk Assessment:
   a. For the worst case for each scenario, identify at each bus location:
      1) Calculated incident energy and associated working distance.
      2) Calculated arc flash boundary.
      3) Bolted fault current.
      4) Arcing fault current.
      5) Clearing time.
      6) Arc gap distance.
   b. For purposes of producing arc flash hazard warning labels, summarize the maximum incident energy and associated data reflecting the worst case condition of all scenarios at each bus location.

1.7 QUALITY ASSURANCE

A. Study Preparer Qualifications: Professional electrical engineer licensed in the State in which the Project is located and with minimum five years experience in preparation of studies of similar type and complexity using specified computer software.
   1. Study preparer may be employed by manufacturer of electrical distribution equipment.
B. Computer Software for Study Preparation: Use the latest edition of commercially available software utilizing specified methodologies.

PART 2 PRODUCTS

2.1 ARC FLASH HAZARD WARNING LABELS

A. Provide warning labels complying with ANSI Z535.4 to identify arc flash hazards for each work location analyzed by the arc flash and shock risk assessment.
   1. Materials: Comply with Section 26 05 53.
   2. Legend: Provide custom legend in accordance with NFPA 70E based on equipment-specific data as determined by arc flash and shock risk assessment.
      a. Include the following information:
         1) Arc flash boundary.

2) Available incident energy and corresponding working distance.
3) Nominal system voltage.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect and test in accordance with NETA ATS, except Section 4.

C. Adjust equipment and protective devices for compliance with studies and recommended settings.

D. Notify Contracting Officer of any conflicts with or deviations from studies. Obtain direction before proceeding.

END OF SECTION 26 05 73

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SECTION 26 05 83 - WIRING CONNECTIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Electrical connections to equipment.

1.2 RELATED REQUIREMENTS

A. Section 26 05 19 - Low-Voltage Electrical Power Conductors and Cables.

B. Section 26 27 26 - Wiring Devices.

1.3 REFERENCE STANDARDS

A. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

B. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

PART 2 PRODUCTS

2.1 MATERIALS

A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.

1. Colors: Comply with NEMA WD 1.
2. Cord Construction: NFPA 70, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.

PART 3 EXECUTION

3.1 ELECTRICAL CONNECTIONS

A. Make electrical connections in accordance with equipment manufacturer's instructions.

B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.

C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.

D. Provide receptacle outlet to accommodate connection with attachment plug.

E. Provide cord and cap where field-supplied attachment plug is required.

F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.

G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.

H. Install terminal block jumpers to complete equipment wiring requirements.

I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

END OF SECTION 26 05 83

SECTION 26 09 23 - LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Occupancy/Vacancy sensors.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems

B. Section 26 05 33.16 - Boxes for Electrical Systems.

C. Section 26 27 26 - Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of wall switch occupancy sensors with actual installed door swings.
2. Coordinate the placement of occupancy sensors with millwork, furniture, equipment or other potential obstructions to motion detection coverage installed under other sections or by others.
3. Notify Contracting Officer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

PART 2 PRODUCTS

2.1 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.2 OCCUPANCY/VACANCY SENSORS

A. All Occupancy Sensors:

1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.

2. Sensor Technology:
   a. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval. Vacancy sensor to have manual on operation and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
6. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
7. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, low-voltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.

B. Wall Switch Occupancy Sensors:
   1. All Wall Switch Occupancy Sensors:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.
      b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
      c. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
   2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet.

C. Wall Dimmer Occupancy Sensors:
   1. General Requirements:
      a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability , and no leakage current to load in off mode.
      b. Operation: Field selectable to operate either as occupancy sensor (automatic on/off) or as vacancy sensor (manual-on/automatic off).
      c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.

D. Ceiling Mounted Occupancy Sensors:
   1. All Ceiling Mounted Occupancy Sensors:
      a. Description: Low profile occupancy sensors designed for ceiling installation.

b. Occupancy sensor to be field selectable as either manual-on/automatic-off or automatic on/off.

2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
   a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet at a mounting height of 9 feet, with a field of view of 360 degrees.

E. Power Packs for Low Voltage Occupancy Sensors:

1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
3. Input Supply Voltage: Dual rated for 120/277 V ac.
4. Load Rating: As required to control the load indicated on drawings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of lighting control devices provided under this section.

C. Install lighting control devices in accordance with manufacturer's instructions.

D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

E. Install lighting control devices plumb and level, and held securely in place.

F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 26 27 26.

G. Provide required supports in accordance with Section 26 05 29.

H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

I. Occupancy Sensor Locations:

1. Location Adjustments: Within the design intent, reasonably minor adjustments to locations may be made in order to optimize coverage and avoid conflicts or problems affecting coverage.
2. Locate dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.

3.2 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Contracting Officer.

END OF SECTION 26 09 23

SECTION 26 24 16 - PANELBOARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Power distribution panelboards.

B. Lighting and appliance panelboards.

C. Overcurrent protective devices for panelboards.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.3 REFERENCE STANDARDS

A. FS W-C-375 - Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NECA 407 - Standard for Installing and Maintaining Panelboards; 2015.

D. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000V or Less; 2023.

F. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

G. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

H. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

I. UL 67 - Panelboards; Current Edition, Including All Revisions.

J. UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.

PART 2 PRODUCTS

2.1 PANELBOARDS - GENERAL REQUIREMENTS

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Short Circuit Current Rating:

1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

C. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.

D. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.

E. Bussing: Sized in accordance with UL 67 temperature rise requirements.

1. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.

F. Conductor Terminations: Suitable for use with the conductors to be installed.

G. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
2. Boxes: Galvanized steel unless otherwise indicated.
   a. Provide wiring gutters sized to accommodate the conductors to be installed.
3. Fronts:
   a. Finish for Painted Steel Fronts: Manufacturer's standard grey unless otherwise indicated.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.

H. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.

2.2 OVERCURRENT PROTECTIVE DEVICES

A. Molded Case Circuit Breakers:

1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
   a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
      1) 10,000 rms symmetrical amperes at 240 VAC or 208 VAC.
      2) 14,000 rms symmetrical amperes at 480 VAC.
3. Conductor Terminations:
   a. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
4. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
5. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

PART 3 EXECUTION

3.1 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.

D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install panelboards plumb.

G. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.

H. Provide grounding and bonding in accordance with Section 26 05 26.

I. Install all field-installed branch devices, components, and accessories.

J. Provide filler plates to cover unused spaces in panelboards.

END OF SECTION 26 24 16

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SECTION 26 27 13 - ELECTRICITY METERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Equipment for Government electricity metering:

1. Single circuit electricity meters.
2. Multi-circuit electricity meters.

1.2 REFERENCE STANDARDS

A. IEEE C57.13 - IEEE Standard Requirements for Instrument Transformers; 2016.

B. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

C. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for electricity metering systems and associated components and accessories. Include ratings, configurations, standard wiring diagrams, dimensions, service condition requirements, and installed features.

PART 2 PRODUCTS

2.1 EQUIPMENT FOR OWNER ELECTRICITY METERING

A. Provide microprocessor-based digital electricity metering systems including all instrument transformers, wiring, and connections necessary for measurements specified.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Provide electricity metering systems and associated components compatible with the equipment and associated circuits to be metered.

D. Service Conditions: Provide electricity meters suitable for operation under the service conditions at the installed location.

E. Enclosures:

1. Where not furnished by manufacturer, provide required cabinets and enclosures in accordance with Section 26 05 33.16.
2. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:
   a. Indoor Clean, Dry Locations: Type 1.
   b. Outdoor Locations: Type 3R or Type 4.
3. Finish: Manufacturer's standard unless otherwise indicated.

F. Instrument Transformers:

1. Comply with IEEE C57.13, where applicable.
2. Select suitable ratio, burden, and accuracy as required for connected devices.

3. Current Transformers: Compatible with connected meters; replace meters damaged by connection of incompatible current transformers. Provide shorting terminal blocks for connection of secondaries where applicable.
4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

PART 3 EXECUTION

3.1 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with manufacturer's instructions.

C. Provide required support and attachment components in accordance with Section 26 05 29.

D. Provide grounding and bonding in accordance with Section 26 05 26.

E. Provide fuses complying with Section 26 28 13 as required.

END OF SECTION 26 27 13

SECTION 26 27 26 - WIRING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Wall switches.

B. Wall dimmers.

C. Receptacles.

D. Wall plates.

E. Floor box service fittings.

F. Poke-through assemblies.

1.2 RELATED REQUIREMENTS

A. Section 26 05 33.16 - Boxes for Electrical Systems.

B. Section 27 10 00 - Structured Cabling: Voice and data jacks.

1.3 REFERENCE STANDARDS

A. FS W-C-596 - Connector, Electrical, Power, General Specification for; 2014h (Validated 2022).

B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2017g (Validated 2023).

C. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

D. NECA 130 - Standard for Installing and Maintaining Wiring Devices; 2016.

E. NEMA WD 1 - General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).

F. NEMA WD 6 - Wiring Devices - Dimensional Specifications; 2016.

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.

I. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.

J. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.

K. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.

L. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.

4. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
5. Notify Contracting Officer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

C. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.1 WIRING DEVICE APPLICATIONS

A. Provide wiring devices suitable for intended use and with ratings adequate for load served.

B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.

C. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.

D. Provide tamper resistant receptacles for receptacles installed in dwelling units.

E. Provide GFCI protection for receptacles installed within 6 feet of sinks.

F. Provide GFCI protection for receptacles installed in kitchens.

G. Provide GFCI protection for receptacles serving electric drinking fountains.

H. Unless noted otherwise, do not use combination switch/receptacle devices.

I. For flush floor service fittings, use tile rings for installations in tile floors.

J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.2 WIRING DEVICE FINISHES

A. Provide wiring device finishes as described below unless otherwise indicated.

B. Wiring Devices, Unless Otherwise Indicated: White with white stainless steel wall plate.

C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.

D. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover.

E. Wiring Devices Connected to Emergency Power: Red with stainless steel wall plate factory engraved "Emergency".

F. Flush Floor Box Service Fittings: Gray wiring devices with aluminum cover and ring/flange.

G. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

2.3 WALL SWITCHES

A. Wall Switches - General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

B. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with decorator style rocker type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

C. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.

2.4 WALL DIMMERS

A. Wall Dimmers - General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

B. Control: Slide control type with separate on/off switch.

C. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

2.5 RECEPTACLES

A. Receptacles - General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.

1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
2. NEMA configurations specified are according to NEMA WD 6.

B. Convenience Receptacles:

1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
2. Weather Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.

3. Tamper Resistant Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.

C. GFCI Receptacles:

1. GFCI Receptacles - General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
   a. Provide test and reset buttons of same color as device.
2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.

2.6 WALL PLATES

A. Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
2. Size: Standard.
3. Screws: Metal with slotted heads finished to match wall plate finish.

B. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

C. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

D. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

E. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.7 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 26 05 33.16 with components, adapters, and trims required for complete installation.

B. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:
   a. Cover: Round.
   b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
   a. Cover: Round.
   b. Voice and Data Jacks: As specified in Section 27 10 00.
3. Single Service Flush Furniture Feed:
   a. Cover: Round.
   b. Configuration: One 2-1/8 inch by 3/4 inch combination threaded opening(s).

4. Dual Service Flush Combination Outlets:
   a. Cover: Round.
   b. Configuration:
      1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
      2) Voice and Data Jacks: As specified in Section 27 10 00.
5. Dual Service Flush Furniture Feed:
   a. Cover: Round.
   b. Configuration:
      1) Power: One 2-1/8 inch by 3/4 inch combination threaded opening(s).
      2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).
6. Accessories:
   a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
   b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

2.8 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

B. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:
   a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
2. Single Service Flush Communications Outlets:
   a. Voice and Data Jacks: As specified in Section 27 10 00.
3. Single Service Flush Furniture Feed:
   a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).
4. Dual Service Flush Combination Outlets:
   a. Cover: Hinged door(s).
   b. Configuration:
      1) Power: One standard convenience duplex receptacle(s).
      2) Voice and Data Jacks: As specified in Section 27 10 00.
5. Dual Service Flush Furniture Feed:
   a. Configuration:
      1) Power: One 3/4 inch threaded opening(s).
      2) Communications: Two 1/2 inch threaded opening(s).
6. Accessories:
   a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain fire rating of floor.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.

C. Verify that wall openings are neatly cut and will be completely covered by wall plates.

D. Verify that final surface finishes are complete, including painting.

E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

F. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.

B. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of wiring devices provided under this section.

1. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
2. Locate wall switches on strike side of door with edge of wall plate 6 inches from edge of door frame. Where locations are indicated otherwise, notify Contracting Officer to obtain direction prior to proceeding with work.
3. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.

C. Install wiring devices in accordance with manufacturer's instructions.

D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.

E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.

F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.

G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.

H. Unless otherwise indicated, GFCI receptacles may be connected to provide feed-through protection to downstream devices. Label such devices to indicate they are protected by upstream GFCI protection.

I. Install wiring devices plumb and level with mounting yoke held rigidly in place.

J. Install wall switches with OFF position down.

K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

L. Do not share neutral conductor on branch circuits utilizing wall dimmers.

M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.

N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.

P. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each wiring device for damage and defects.

C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.

D. Test each receptacle to verify operation and proper polarity.

E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.

F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.5 ADJUSTING

A. Adjust devices and wall plates to be flush and level.

B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Contracting Officer.

3.6 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26

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SECTION 26 28 13 - FUSES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fuses.

1.2 RELATED REQUIREMENTS

A. Section 26 28 16.16 - Enclosed Switches: Fusible switches.

1.3 REFERENCE STANDARDS

A. NEMA FU 1 - Low Voltage Cartridge Fuses; 2012.

B. UL 248-1 - Low-Voltage Fuses - Part 1: General Requirements; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

PART 2 PRODUCTS

2.1 FUSES

A. Provide products listed, classified, and labeled as suitable for the purpose intended.

B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.

C. Provide fuses of the same type, rating, and manufacturer within the same switch.

D. Comply with UL 248-1.

E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.

F. Voltage Rating: Suitable for circuit voltage.

PART 3 EXECUTION

3.1 INSTALLATION

A. Do not install fuses until circuits are ready to be energized.

B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

END OF SECTION 26 28 13

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SECTION 26 28 16.16 - ENCLOSED SWITCHES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Enclosed safety switches.

1.2 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 28 13 - Fuses.

1.3 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

B. NEMA EN 10250 - Enclosures for Electrical Equipment (1000 Volts Maximum); 2024.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. UL 50 - Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.

E. UL 50E - Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.

F. UL 98 - Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
4. Notify Contracting Officer of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.

PART 2 PRODUCTS

2.1 ENCLOSED SAFETY SWITCHES

A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.

B. Provide products listed, classified, and labeled as suitable for the purpose intended.

C. Horsepower Rating: Suitable for connected load.

D. Voltage Rating: Suitable for circuit voltage.

E. Short Circuit Current Rating:

1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.

F. Provide with switch blade contact position that is visible when the cover is open.

G. Conductor Terminations: Suitable for use with the conductors to be installed.

H. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.

I. Enclosures: Comply with NEMA EN 10250, and list and label as complying with UL 50 and UL 50E.

1. Environment Type per NEMA EN 10250: Unless otherwise indicated, as specified for the following installation locations:

J. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install enclosed switches plumb.

F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.

G. Provide grounding and bonding in accordance with Section 26 05 26.

END OF SECTION 26 28 16.16

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Interior luminaires.

B. Emergency lighting units.

C. Exit signs.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

B. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. NECA/IESNA 500 - Standard for Installing Indoor Commercial Lighting Systems; 2025.

B. NECA/IESNA 502 - Standard for Installing Industrial Lighting Systems; 2006.

C. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

D. NFPA 101 - Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. UL 924 - Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.

F. UL 1598 - Luminaires; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
4. Notify Contracting Officer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings. Luminaires indicated on schedule are Basis of Design.

B. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

2.3 EMERGENCY LIGHTING UNITS

A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.

B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

1. Size battery to supply all connected lamps, including emergency remote heads where indicated.

D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.

E. Provide low-voltage disconnect to prevent battery damage from deep discharge.

2.4 EXIT SIGNS

A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.

1. Number of Faces: Single- or double-face as indicated or as required for installed location.
2. Directional Arrows: As indicated or as required for installed location.

B. Powered Exit Signs: Internally illuminated with LEDs unless otherwise indicated.

PART 3 EXECUTION

3.1 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Install products in accordance with manufacturer's instructions.

C. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).

D. Provide required support and attachment in accordance with Section 26 05 29.

E. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

F. Install accessories furnished with each luminaire.

G. Bond products and metal accessories to branch circuit equipment grounding conductor.

H. Emergency Lighting Units:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

I. Exit Signs:

1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.

J. Install lamps in each luminaire.

END OF SECTION 26 51 00

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SECTION 26 56 00 - EXTERIOR LIGHTING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Exterior luminaires.

B. Ballasts.

C. Poles and accessories.

D. Luminaire accessories.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Materials and installation requirements for concrete bases for poles.

B. Section 26 05 29 - Hangers and Supports for Electrical Systems.

C. Section 26 05 33.16 - Boxes for Electrical Systems.

1.3 REFERENCE STANDARDS

A. IEEE C2 - National Electrical Safety Code; 2017.

B. IES LM-79 - Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.

C. IES LM-80 - Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NECA/IESNA 501 - Standard for Installing Exterior Lighting Systems; 2006.

F. NEMA LE 4 - Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).

G. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

H. UL 1598 - Luminaires; Current Edition, Including All Revisions.

I. UL 8750 - Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate placement of poles and associated foundations with utilities, curbs, sidewalks, trees, walls, fences, striping, etc. installed under other sections or by others. Coordinate elevation to obtain specified foundation height.
2. Notify Contracting Officer of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Shop Drawings:

1. Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.

C. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, weight, effective projected area (EPA), and installed accessories; include model number nomenclature clearly marked with all proposed features.

1. LED Luminaires:
   a. Include estimated useful life, calculated based on IES LM-80 test data.

D. Certificates for Poles and Accessories: Manufacturer's documentation that products are suitable for the luminaires to be installed and comply with designated structural design criteria.

E. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.6 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Receive, handle, and store products according to NECA/IESNA 501 and manufacturer's written instructions.

B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.8 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data, for additional warranty requirements.

B. Provide 2-year manufacturer warranty for all LED luminaires, including drivers.

PART 2 PRODUCTS

2.1 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings. Luminaires indicated on schedule are Basis of Design.

B. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 LUMINAIRES

A. Provide products that comply with requirements of NFPA 70.

B. Provide products that are listed and labeled as complying with UL 1598, where applicable.

C. Provide products listed, classified, and labeled as suitable for the purpose intended.

D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.

E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, poles, foundations, supports, trims, accessories, etc. as necessary for a complete operating system.

F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.

G. Provide luminaires listed and labeled as suitable for wet locations unless otherwise indicated.

H. Recessed Luminaires:

1. Ceiling Compatibility: Comply with NEMA LE 4.
2. Luminaires Recessed in Insulated Ceilings: Listed and labeled as IC-rated, suitable for direct contact with insulation and combustible materials.
3. Luminaires Recessed in Sloped Ceilings: Provide suitable sloped ceiling adapters.

I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

J. LED Luminaires:

1. Components: UL 8750 recognized or listed as applicable.
2. Tested in accordance with IES LM-79 and IES LM-80.
3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.

2.3 BALLASTS AND DRIVERS

A. Ballasts/Drivers - General Requirements:

1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.

B. Dimmable LED Drivers:

1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
2. Control Compatibility: Fully compatible with the dimming controls to be installed.

2.4 POLES

A. All Poles:

1. Provide poles and associated support components suitable for the luminaire(s) and associated supports and accessories to be installed.
2. Structural Design Criteria:
3. Material: Steel, unless otherwise indicated.
4. Shape: Square straight, unless otherwise indicated.
5. Finish: Match luminaire finish, unless otherwise indicated.
6. Mounting: Install on concrete foundation, height as indicated on the drawings, unless otherwise indicated.
7. Unless otherwise indicated, provide with the following features/accessories:
   a. Top cap.
   b. Anchor bolts with leveling nuts or leveling shims.

c. Anchor base cover.

B. Metal Poles: Provide ground lug, accessible from handhole.

2.5 ACCESSORIES

A. Stems for Suspended Luminaires: Steel tubing, minimum 1/2" size, factory finished to match luminaire or field-painted as directed.

B. Threaded Rods for Suspended Luminaires: Zinc-plated steel, minimum 1/4" size.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.

C. Verify that suitable support frames are installed where required.

D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.

E. Verify that conditions are satisfactory for installation prior to starting work.

3.2 PREPARATION

A. Provide extension rings to bring outlet boxes flush with finished surface.

B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.3 INSTALLATION

A. Coordinate locations of outlet boxes provided under Section 26 05 33.16 as required for installation of luminaires provided under this section.

B. Perform work in accordance with NECA 1 (general workmanship).

C. Install products in accordance with manufacturer's instructions.

D. Install luminaires in accordance with NECA/IESNA 501.

E. Provide required support and attachment in accordance with Section 26 05 29.

F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.

G. Recessed Luminaires:

1. Install trims tight to mounting surface with no visible light leakage.

H. Suspended Luminaires:

1. Unless otherwise indicated, specified mounting heights are to bottom of luminaire.
2. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
3. Unless otherwise indicated, support pendants from swivel hangers.

I. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.

J. Pole-Mounted Luminaires:

1. Maintain the following minimum clearances:
   a. Comply with IEEE C2.
   b. Comply with utility company requirements.
2. Foundation-Mounted Poles:
   a. Provide cast-in-place concrete foundations for poles as indicated, in accordance with Section 03 30 00.
      1) Install anchor bolts plumb per template furnished by pole manufacturer.
      2) Position conduits to enter pole shaft.
   b. Install foundations plumb.
   c. Install poles plumb, using leveling nuts or shims as required to adjust to plumb.
   d. Tighten anchor bolt nuts to manufacturer's recommended torque.
3. Grounding:
   a. Bond luminaires, metal accessories, metal poles, and foundation reinforcement to branch circuit equipment grounding conductor.
4. Install separate service conductors, 12 AWG copper, from each luminaire down to handhole for connection to branch circuit conductors.

K. Install accessories furnished with each luminaire.

L. Bond products and metal accessories to branch circuit equipment grounding conductor.

M. Install lamps in each luminaire.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Inspect each product for damage and defects.

C. Operate each luminaire after installation and connection to verify proper operation.

D. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Contracting Officer.

3.5 ADJUSTING

A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Contracting Officer. Secure locking fittings in place.

B. Luminaires with Field-Rotatable Optics: Position optics according to manufacturer's instructions to achieve lighting distribution as indicated or as directed by Contracting Officer.

3.6 CLEANING

A. Clean surfaces according to NECA/IESNA 501 and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.7 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION 26 56 00

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SECTION 27 05 00 - COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 QUALITY ASSURANCE

A. Specifications, Standards, and Codes

1. All work shall be in accordance with the following:
   a. This Technical Specification and Associated Drawings
   b. TIA/EIA 568-C.0 Generic Telecommunications Cabling for Customer Premises
   c. TIA/EIA 568-C.1 Commercial Building Telecommunications Cabling Standard
   d. TIA/EIA 568-C.2 Balanced Twisted Pair Cabling Components Standard
   e. TIA/EIA 568-C.3 Optical Fiber Cabling Components Standard
   f. TIA/EIA 942 Telecommunications Infrastructure for Data Centers
   g. TIA/TIA 569-A Commercial Building Standard for Telecommunications Pathways and Spaces
   h. TIA/EIA 606-A Administration Standard for the Telecommunications Infrastructure of Commercial
   i. ANSI-J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
   j. ANSI/TIA-758-A Customer Owned Outside Plant Telecommunications Infrastructure Standard
   k. National Fire Protection Agency (NFPA)-70 National Electric Code (NEC)
   l. UL 50 Enclosures for Electrical Equipment
   m. Current design and installation agreement with single solution manufacturer.
2. If a conflict exists between applicable documents that cannot be verbally negotiated, then the order in the list above starting with #1 above shall dictate the order of precedence in resolving conflicts. This order of precedence shall be maintained unless a lesser order document has been adopted as code by a local, state or federal entity, and is therefore enforceable as law by a local, state, or federal inspection agency. If a conflict is found, it shall be the discovering party's responsibility to notify the Design Professional of these specifications for clarification and resolution.
3. Comply with all requirements for permits and tests, shall provide all certificates, and shall pay all costs for same.

1.2 SCOPE

A. The work to be done under this Section of the Specifications shall include the furnishing of labor, material, equipment and tools required for the complete installation of the work indicated on the Drawings or as specified herein.

B. All materials, obviously a part of the Telecommunications Infrastructure and necessary to its proper operation, but not specifically mentioned or shown on the Drawings, shall be furnished and installed without additional charge.

C. The Drawings and Specifications are complementary to each other and what is called for by one shall be as binding as if called for by both. If a discrepancy exists between the Drawing and

Specifications, the higher cost shall be included, and the Design Professional shall be notified of the discrepancy.

1.3 WORK INCLUDED

A. The Communications Infrastructures installed and work performed under this Division of the Specifications shall include but not necessarily be limited to the following:

1. Horizontal and Backbone Cabling Infrastructure
2. Telecommunications conduits, raceways, cable tray, racks, cabinets and equipment mounting boards as indicated on the Drawings.
3. Grounding and Bonding
4. Concrete work for wall and floor penetration.

1.4 DEFINITIONS

A. Terms: The following definitions of terms supplement those of the GENERAL REQUIREMENTS and are applicable to the TELECOMMUNICATIONS WORK SCOPE.

B. Provide: As used herein shall mean "furnish, install and test (if applicable) complete".

C. Infrastructure: As used herein shall mean cable, installed in conduit, raceway, or cable tray with all required boxes, fittings, connectors, and accessories; completely installed."

D. Work: As used herein shall be understood to mean the materials completely installed, including the labor involved.

1.5 DRAWINGS

A. Drawings are generally diagrammatic and show the arrangement and location of pathways, outlets, support structures and equipment. Carefully investigate the structural and finish conditions affecting his work and arrange his work accordingly. Should conditions on the job make it necessary to make adjustments to pathways or materials, advise the Engineer and secure approval before proceeding with such work.

B. Where exact locations are required by equipment for stubbing-up and terminating conduit concealed in floor slabs, request shop Drawings, equipment location Drawings, foundation Drawings, and any other data required by him to locate the concealed conduit before the floor slab is poured.

C. Materials, equipment or labor not indicated but which can be reasonably inferred to be necessary for a complete installation shall be provided. Drawings and Specifications do not undertake to indicate every item of material, equipment, or labor required to produce a complete and properly operating installation.

D. The right is reserved to make reasonable changes in locations of equipment indicated on Drawings prior to rough-in without increase in contract cost.

E. Do not reduce the size or number of conduit runs indicated on the Drawings without the written approval of the Engineer.

F. Any work installed contrary to Contract Drawings shall be subject to change as directed by the Engineer, and no extra compensation will be allowed for making these changes.

G. The location of equipment, support structures, outlets, and similar devices shown on the Drawings are approximate only. Do not scale Drawings. Obtain layout dimensions for equipment from Architectural plans unless indicated on Technology plans.

H. Schematic diagrams shown on the Drawings indicate the required functions only. The technology of a particular manufacturer may be used to accomplish the functions indicated without exact adherence to the schematic Drawings shown. Additional labor and materials required for such deviations shall be additional expense.

I. Verify the ceiling type, ceiling suspension systems, and clearance above hung ceilings prior to ordering cabling and associated hardware. Notify the Engineer of any discrepancies.

J. Review all architectural Drawings for modular furniture.

K. Portions of these Drawings and Specifications are abbreviated and may include incomplete sentences. Omissions of words or phrases such as "the Contractor shall", "shall be", "as indicated on the Drawings", "In accordance with", "a", "the" and "all are intended" shall be supplied by inference.

1.6 QUALITY ASSURANCE

A. Equipment and materials required for installation under these Specifications shall be the current model and new (less than one [1] year from the date of manufacture), unused and without blemish or defect.

B. Equipment shall bear labels attesting to Underwriters Laboratories or certification by other recognized laboratory, where subject to label service. Manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacture of said equipment a minimum of three (3) years and, if so directed by the Government, be able to furnish proof of their ability by submitting affidavits and descriptive data about their product including size and magnitude comparable to requirements specified herein.

1.7 CONTRACTOR QUALIFICATIONS

A. Have total responsibility for the coordination and installation of the work shown and described in the Drawings and Specifications. Shall be a company specializing in the design, fabrication and installation of integrated telecommunications systems.

1.8 COORDINATION WITH OTHER TRADES

A. Coordinate telecommunications work with that of other Sections as required to ensure that the entire telecommunications work will be carried out in an orderly, complete and coordinated fashion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. All materials used in this work shall be new and shall bear the inspection label of Underwriters' Laboratories Inc. or certification by other recognized laboratory.

B. The published standards and requirements of the Telecommunications Industries Association (TIA), National Electrical Manufacturers Association (NEMA), the American National Standard Institute (ANSI), the Institute of Electrical and Electronic Engineers (IEEE), and the

American Society of Testing Materials (ASTM), are made a part of these Specifications and shall apply wherever applicable.

C. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.

D. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer or partner manufacturers that offer a certified solution.

E. Components of an assembled unit need not be products of the same manufacturer, but must offer a certified end-to-end solution.

F. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.

G. Components shall be compatible with each other and with the total assembly for the intended service.

PART 3 - EXECUTION

3.1 EXAMINATION OF SURFACE CONDITIONS

A. Prior to the start of work, carefully inspect the installed work of other trades and verify that such work is complete to the point where installation may properly commence. Start of work indicates acceptance of conditions.

B. Install equipment in accordance with applicable codes and regulations, the original design and the referenced standards.

C. In the event of a discrepancy, immediately notify the Project Manager.

D. Do not proceed with installation until unsatisfactory conditions and discrepancies have been fully resolved.

3.2 PROTECTION OF SYSTEMS AND EQUIPMENT

A. Protect materials and equipment from damage during storage at the site and throughout the construction period. Equipment and materials shall be protected during shipment and storage against physical damage, dirt, theft, moisture, extreme temperature and rain.

B. Damage from rain, dirt, sun and ground water shall be prevented by storing the equipment on elevated supports and covering the sides with securely fastened protective rigid or flexible waterproof coverings.

C. During installation, equipment shall be protected against entry of foreign matter on the inside and be vacuum cleaned both inside and outside before testing, operating or painting.

D. As determined by the Project Manager, damaged equipment shall be fully repaired or shall be removed and replaced with new equipment to fully comply with requirements of the Contract Documents. Decision of the Project Manager shall be final.

E. Damaged paint on equipment and materials shall be repainted with painting equipment and finished with the same quality of paint and workmanship as used by the manufacturer.

3.3 ACCESS TO EQUIPMENT

A. Equipment shall be installed in location and manner that will allow convenient access for maintenance and inspection.

B. Working spaces shall be not less than specified in the National Electrical Code (NEC) for voltages specified.

C. Where the Project Manager determines that the installed equipment is not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled, one time only, as directed by the Project Manager, at no additional cost to the Government. "Conveniently accessible" is defined as being capable of being reached without the use of ladders or without climbing or crawling under or over obstacles such as motors, pumps, belt guards, transformers, piping and duct work.

3.4 CLEANING

A. During construction, and prior to Government acceptance of the building, remove from the premises and dispose of packing material and debris caused by telecommunications work.

B. Remove dust and debris from interiors and exteriors of electrical equipment. Clean accessible current carrying elements prior to being energized.

3.5 COMPLETION

A. General: Upon completion of the work, remove excess debris, materials, equipment, apparatus, tools and similar items. Leave the premises clean, neat and orderly.

B. Results Expected: Systems shall be complete and operational and controls shall be set and calibrated. Testing, start-up and cleaning work shall be complete.

C. Maintenance Materials: Special tools for proper operation and maintenance of the equipment provided under this Specification shall be delivered to the Government.

3.6 SURFACE MOUNTED CONDUIT AND DEVICES

A. New Construction: Unless otherwise noted on the drawings or specifications, all conduit shall be concealed and wall mounted devices recessed flush within walls. Surface mounted conduit and devices are prohibited.

B. Renovations: Unless otherwise note on the drawings or specifications, all conduit shall be concealed and wall mounted devices recessed within existing walls. Contractors pricing to include cutting existing walls to install concealed conduit and flush wall mounted devices. Price to also include patching existing walls back to original condition. Surface mounted conduit and devices are prohibited.

END OF SECTION 27 05 00

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SECTION 27 05 26 - GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1- GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Grounding & Bonding for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document.

D. Locations of telecommunications equipment and typical installation details will be provided on Drawings as an attachment to this document. If the bid documents are in conflict, the Drawings shall take precedence. The successful vendor shall meet or exceed all requirements described in this document.

1.2 WORK INCLUDED

A. The work included under this Specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. Provide and install all of the required material whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install all Grounding Conductors.
2. Furnish and install all Grounding Lugs and Hardware.

C. Perform installation and termination of the main bonding conductor to the building service entrance ground.

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

A. Grounding Conductor

1. Construction shall be Type THHN copper conductors, insulated with heat and moisture resistant PVC over which a UL listed jacket is applied.
2. Jacket color shall be green. Jacketed cable shall be identified at each termination point with a wrap of green tape.

2.2 GROUNDING LUGS

A. Grounding Lugs and Hardware

1. Grounding lugs shall be 2-hole and installed with a crimper that when properly executed the die of the crimper impresses the die # on the lug base. All lugs shall be sleeved with clear heat-shrink to allow for inspection of the crimp. Silicon bronze or stainless steel bolts and washers shall be used to install lugs to equipment. Exothermic welding is also allowed.

PART 3 - EXECUTION

3.1 GROUNDING

A. All equipment, racks, cabinets, enclosures, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the MC/IC/TC shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression lugs.

B. All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap or green tape. All cables and busbars shall be identified and labeled in accordance with the ANSI/TIA/EIA- 606-A.

C. The ground/earth system must be designed for high reliability. Therefore, the grounding/earthing system shall meet following criteria:

1. Local electrical codes shall be adhered to.
2. The grounding/earthing system shall comply with ANSI/TIA-942 and J-STD-607-A.
3. All grounding/earthing conductors shall be copper.
4. Lugs, HTAPs, grounding strips, and busbars shall be UL Listed and made of premium quality tin-plated electrolytic copper that provides low electrical resistance while inhibiting corrosion. Antioxidant shall be used when making bonding connections in the field.

D. The gauge of the connecting ground/earth cable, known as the Telecommunications Bonding Backbone (TBB) will follow J-STD-607-A guidelines, as is shown in the table below.

Sizing of the TBB	
TBB Length in Linear meters (feet)	TBB Size (AWG)
Less than 4 (13)	6
4-6 (14-20)	4
6-8 (21-26)	3
8-10 (27-33)	2
10-13 (34-41)	1
13-16 (42-52)	1/0
16-20 (53-66)	2/0
Greater than 20 (66)	3/0

E. Ladder racks shall be bonded per the manufacturer’s installation instructions. To provide electrical continuity between ladder rack segments drill holes in rack and use a #6 AWG code cable with green/yellow stripe to jumper between segments. The jumper shall be made with 2-hole copper compression connectors terminated on both ends. Attach jumpers as required to ladder rack and then bond the entire assembly to the TGB.

F. Equipment and racks shall be bonded in accordance with the methods prescribed in ANSI/TIA-942. To provide electrical continuity between rack elements, paint piercing grounding washers shall be used where rack sections bolt together, on both sides, under the head of the bolt and between the nut and rack. All racks shall utilize a full-length rack ground strip attached to the

rear of the side rail with thread-forming screws to ensure metal-to-metal contact. Patch panels will be bonded to racks using bonding screws for racks having #12-24 equipment mounting holes.

G. Reference low voltage drawing package for additional requirements.

END OF SECTION 27 05 26

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SECTION 27 05 28 - PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

A. Applicable requirements of Division 27 Communications shall be considered a part of this section and shall have the same force as if printed herein full.

B. This document describes the products and execution requirements relating to Pathways for Communications Systems.

C. Product specifications, general design considerations, and installation guidelines are provided in this document. Locations of interior telecommunications pathways and typical installation details will be provided on Drawings as an attachment to this document. If the bid documents are in conflict, the Drawings shall take precedence. The successful vendor shall meet or exceed all requirements described in this document.

1.2 WORK INCLUDED

A. The work included under this Specification consists of furnishing all labor, equipment, materials, supplies and performing all operations necessary to complete the installation. Provide and install all of the required material whether specifically addressed in the technical specifications or not.

B. The work shall include, but not be limited to the following:

1. Furnish and install complete Conduit System – Reference Electrical Specifications.
2. Furnish and install all Telecommunications Outlet Boxes.
3. Furnish and install all Pull Boxes.
4. Furnish and install complete Cable Tray System.
5. Furnish and install all Velcro Straps.

PART 2 PRODUCTS

2.1 APPROVED PRODUCTS

A. Innerduct

1. Exposed innerduct shall be rated CMP (plenum), corrugated plastic equipped with pull-string or mule tape.
2. Sizes shall be 2”, 1-1/4” & 1” inside diameter.
3. See Drawings for innerduct details.

2.2 PULL BOXES

A. Pull boxes shall be constructed of galvanized steel with flat, removable covers fastened with plated steel screws.

B. Pull boxes shall be equipped with keyhole screw slots in the cover to permit removal of the cover without extracting the screws.

C. Pull boxes shall have provisions for grounding.

2.3 CABLE TRAY

A. Steel, complying with NEMA VE 1.

1. Factory-standard primer, ready for field painting; with cadmium-plated hardware according to ASTM B 766.
2. Mill galvanized before fabrication, complying with ASTM A 653/A 653M, G90 (Z275) coating; with hardware galvanized according to ASTM B 633. Electrogalvanized before fabrication, complying with ASTM B 633; with hardware galvanized according to ASTM B 633.
3. Hot-dip galvanized after fabrication, complying with ASTM A 123/A 123M, Class B2; with chromium-zinc, ASTM F 1136, hardware.
4. Epoxy-resin paint over paint manufacturer's recommended primer and corrosion-inhibiting treatment; with cadmium-plated hardware according to ASTM B 766.

B. Sizes and Configurations: See drawings.

C. Center-hanger supports may be used only when specifically indicated.

D. Cable Tray Accessories:

1. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.
2. Barrier Strips: Same materials and finishes as cable tray.
3. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

E. Warning - Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

F. Materials and fastening are specified in Division 26 Section "Electrical Identification."

G. Source Quality Control - Perform design and production tests according to NEMA VE 1.

2.4 VELCRO STRAPS

A. Velcro Straps

1. Cables shall be fastened to support structures with Velcro straps.
2. Velcro straps installed in air handling spaces must be plenum rated.
   a. Plenum Velcro strap color shall be red.
3. Use 1-inch wide Velcro to secure cables to all support structures.

PART 3 - EXECUTION

3.1 CABLE TRAY INSTALLATION

A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.

B. Remove burrs and sharp edges from cable trays.

C. Fasten cable tray supports to building structure.

1. Design each fastener and support to carry load indicated by seismic requirements.

2. Place supports so that spans do not exceed maximum spans on schedules.
3. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
4. Support bus assembly to prevent twisting from eccentric loading.
5. Manufacture center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.
6. Locate and install supports according to NEMA VE 1.

D. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.

E. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA VE 1. Space connectors and set gaps according to applicable standard.

F. Make changes in direction and elevation using standard fittings.

G. Make cable tray connections using standard fittings.

H. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

I. Workspace: Install cable trays with enough space to permit access for installing cables.

J. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

K. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.

3.2 CONNECTIONS

A. Ground cable trays according to manufacturer's written instructions.

B. Install an insulated equipment grounding conductor with cable tray, in addition to those required by NFPA 70.

3.3 FIELD QUALITY CONTROL

A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.

5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.

B. Report results in writing.

3.4 PROTECTION

A. Protect installed cable trays.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by cable tray manufacturer.
2. Repair damage to PVC or paint finishes with matching touchup coating recommended by cable tray manufacturer.

3.5 PENETRATIONS

A. Holes through concrete and masonry in new and existing structures shall be cut with a diamond core drill or concrete saw upon approval of the structural engineer of record for the base of building. Impact electric, hand or manual hammer type drills shall not be allowed, except where permitted by the Project Manager as required by limited working space. X-ray all floor penetrations accordingly.

B. Holes shall be located so as not to affect structural sections such as ribs or beams.

C. Holes shall be laid out in advance. The Project Manager shall be advised prior to drilling through structural sections, for determination of proper layout.

D. Structural Penetrations: Where conduits, wireways and other raceways pass through fire partitions, fire walls or walls and floors provide a code compliant effective barrier against the spread of fire, smoke and gases.

E. All penetrations where conduit is not used shall be sleeved.

F. No gaps or rough edges shall be allowed between wall and conduit/sleeve.

3.6 CONDUIT SYSTEM

A. All conduit shall not be less than 3/4” trade size.

B. No more than two 90 degree sweep bends or the equivalent shall be permitted between junction boxes, pull boxes, cabinets, or cable access points.

C. Conduit shall be provided as a continuous run perpendicular from the cable tray to the work area outlet. All cables shall be enclosed in conduit or cable tray for protection.

D. Conceal all conduits, except in unfinished spaces such as equipment rooms or as indicated by symbol on the Drawings.

E. Leave all empty conduits with a 200 pound test nylon cord pull line.

F. A 200 pound test nylon cord pull line shall be co-installed with all cable installed in any conduit.

G. Flattened, dented, or deformed conduits are not permitted and shall be removed and replaced.

H. Fasten conduit support device to structure with wood screws on wood, toggle bolts on hollow masonry, anchors as specified on solid masonry or concrete, and machine bolts, clamps, or spring steel clips, on steel.

I. Install conduit with wiring, including homeruns as indicated on the Drawings. Any change resulting in a savings in labor or materials is to be made only in accordance with a contract change. Deviations shall be made only where necessary to avoid interferences and when approved by Engineer by written authorization.

J. Conduit shall be run parallel or at right angles to existing walls, ceilings, and structural members.

K. Attach backbone conduits larger than one-inch trade diameter to or from structure on intervals not exceeding twelve feet with conduit beam clamps, one-hole conduit straps or trapeze type support.

L. Where conduits must pass through structural members obtain approval of Design Professional.

M. Install all conduits or sleeves penetrating or routed within rated firewalls or fire floors to maintain fire rating of wall or floor. Conduit shall not be installed in rated floors or walls if it compromises or violates the fire rating of floor or wall. Refer to architectural documents.

N. Provide expansion and deflection coupling where conduit passes over a building expansion joint.

O. All other conduit, unless specified herein, shall be electrical metallic tubing (EMT). PVC conduit is not allowed in exposed or concealed areas. PVC to be installed below concrete in grade. Utilize Rigid Galvanized Steel (RGS) elbows for all slab penetrations and stub- ups.

P. Metallic conduits shall be grounded in accordance with J-STD-607-A.

Q. For runs that total more than 100 feet in length, insert pull boxes so that no segment between boxes exceeds the 100 feet limit.

R. Conduit runs shall not have more than two (2) 90-degree bends between pull points.

S. Telecommunications conduit system shall contain no condulets (also known as an LB).

T. Horizontal Conduits: Support horizontal conduits at intervals not exceeding ten feet and within three feet of each outlet, junction box, backboard, enclosure or cabinet. Support conduits from structural steel members with spring steel type or beam conduit clamps and to non-metallic structural members with one-hole conduit straps. For exposed conduits and where conduits must be suspended below structure, single conduit runs shall be supported from structure by hanger rod and conduit clamp assembly, and multiple conduits shall be supported by trapeze type support suspended from structure. Do not attach conduits to ceiling suspension system channels or suspension wires.

3.7 TELECOMMUNICATIONS OUTLET BOXES

A. Exact locations of the outlet boxes shall be coordinated with other trades.

B. The approximate locations of the outlets are indicated on the Drawings. The exact locations shall be determined at the building. The right is reserved to change, without additional cost, the exact location of any outlet, a maximum of 10' before it is permanently installed.

C. Install all outlet boxes in finished areas flush with the wall. Maintain 1/4" or less space between outlet box front and finished wall surface.

D. Outlet boxes shall be firmly anchored in place and shall not depend on the cover plate to hold it secure to the wall.

E. Outlet boxes installed back-to-back in fire-rated walls shall be separated horizontally by a minimum of 24".

3.8 PULL BOXES

A. Pull boxes shall be secured, independent of the conduit entries into the box. Pull boxes shall be secured to the building structure. In ceiling applications, pull boxes shall not be supported with ceiling wires.

B. Conduits entering pull boxes shall connect to pull boxes using die-cast zinc connectors.

C. Pull boxes shall be installed in accordance with ANSI/TIA/EIA-569-A.

D. Pull boxes shall be grounded in accordance with J-STD-607-A.

3.9 CABLE TRAY SYSTEM

A. Install trays in accordance with recognized industry practices, to ensure that the cable tray equipment complies with requirements of the NEC.

B. All open trays shall be installed a minimum of six (6) inches away from any light fixture.

C. Provide external grounding strap at expansion joints, sleeves, crossover and other locations where tray continuity is interrupted.

D. Support all pathways from building construction. Do not support pathways from ductwork, piping or equipment hangers.

E. Install cable tray level and straight.

F. Provide all hardware, accessories, fasteners, anchors, threaded rods and support channels required to provide a complete cable tray system.

G. Cable trays shall not be used to house both low voltage and power cables unless cables are separated by a grounded physical barrier.

H. Cable tray system shall be grounded in accordance with J-STD-607-A.

I. Bundle horizontal distribution cables in groups not greater than 50 cables.

3.10 VELCRO STRAPS

A. Velcro straps shall be installed around cables at intervals of 12" minimum.

B. Do not over-cinch cables.

END OF SECTION 27 05 28

SECTION 27 05 29 - HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other communications work.

1.2 RELATED REQUIREMENTS

A. Section 26 05 29 - Hangers and Supports for Electrical Systems.

1.3 REFERENCE STANDARDS

A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.

B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.

C. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

D. BICSI ITSIMM - Information Technology Systems Installation Methods Manual (ITSIMM), 8th Edition; 2022.

E. BICSI N1 - Installation Practices for Telecommunications and ICT Cabling and Related Cabling Infrastructure, 1st Edition; 2019.

F. MFMA-4 - Metal Framing Standards Publication; 2004.

G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. TIA-569 - Telecommunications Pathways and Spaces; 2019e.

PART 2 PRODUCTS

2.1 SUPPORT AND ATTACHMENT COMPONENTS

A. General Requirements:

1. Comply with the following. Where requirements differ, comply with most stringent.
   a. TIA-569.
   b. NFPA 70.
   c. Requirements of authorities having jurisdiction.
2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of communications work.
3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported.

Include consideration for vibration, equipment operation, and shock loads where applicable.

5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
   a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
   b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.

B. Conduit Supports: Straps and clamps suitable for conduit to be supported.

1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
2. Conduit Clamps: Bolted type unless otherwise indicated.

C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.

D. Metal Channel/Strut Framing Systems:

1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
2. Comply with MFMA-4.

E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.

F. Anchors and Fasteners:

1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.

B. Install hangers and supports in accordance with NECA 1, BICSI ITSIMM, and BICSI N1.

C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.

D. Unless specifically indicated or approved by Contracting Officer, do not provide support from suspended ceiling support system or ceiling grid.

E. Unless specifically indicated or approved by Contracting Officer, do not provide support from roof deck.

F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

G. Equipment Support and Attachment:

1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.

3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.

H. Secure fasteners in accordance with manufacturer's recommended torque settings.

I. Remove temporary supports.

END OF SECTION 27 05 29

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SECTION 28 46 00 - FIRE DETECTION AND ALARM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Fire alarm system design and installation, including all components, wiring, and conduit.

1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).

D. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

E. NFPA 72 - National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Proposal Documents: Submit the following with cost/time proposal:

1. NFPA 72 "Record of Completion", filled out to the extent known at the time.
2. Manufacturer's detailed data sheet for each control unit, initiating device, and notification appliance.
3. Certification by Contractor that the system design will comply with Contract Documents.
4. Proposed maintenance contract.

C. Evidence of designer qualifications.

D. **Design Documents:** Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation prepared and sealed by a licensed engineer meeting the qualifications stated under the Quality Assurance section of this specifications section below. Additionally, the information submitted shall include the following:

1. Copy (if any) of list of data required by authority having jurisdiction.
2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
4. System zone boundaries and interfaces to fire safety systems.
5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
6. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly for periodic maintenance.

7. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
8. List of all devices on each signaling line circuit, with spare capacity indicated.
9. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
10. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
11. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
12. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
13. Certification by Contractor that the system design complies with Contract Documents.

E. Evidence of installer qualifications.

F. Inspection and Test Reports:

1. Submit inspection and test plan prior to closeout demonstration.
2. Submit documentation of satisfactory inspections and tests.
3. Submit NFPA 72 "Inspection and Test Form," filled out.

G. Operating and Maintenance Data:

1. Complete set of specified design documents, as approved by authority having jurisdiction.
2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
4. List of recommended spare parts, tools, and instruments for testing.
5. Replacement parts list with current prices, and source of supply.
6. Detailed troubleshooting guide and large scale input/output matrix.
7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Government.
8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

H. Project Record Documents:

1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
2. "As installed" wiring and schematic diagrams, with final terminal identifications.
3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

I. Closeout Documents:

1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.

2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.4 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction, and by meeting one or more of the following:

1. A fire protection engineer.
2. A NICET III technician for the type of system designed.
3. As approved by the FCO

B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Fire alarm system shall be installed by someone meeting one or more of the following:
   a. State or municipal certified/licensed fire alarm contractor
   b. Qualified by manufacturer. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
   c. NICET Level II
   d. As approved by FCO
2. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
3. Installer Personnel: At least 2 years of experience installing fire alarm systems.
4. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
5. Certified in the State in which the Project is located as fire alarm installer.

PART 2 PRODUCTS

2.1 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new automatic fire detection and alarm system:

1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
2. Protected Premises: Entire building shown on drawings.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
   a. ADA Standards.
   b. Applicable local codes.
   c. Contract Documents (drawings and specifications).
   d. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.

4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
6. Program notification zones and voice messages as directed by Government.
7. Fire Command Center: Location indicated on drawings.
8. Fire Alarm Control Unit: New, located at fire command center.

B. Supervising Stations and Fire Department Connections:

1. Public Fire Department Notification: By on-premises supervising station.

C. Circuits:

1. Initiating Device Circuits (IDC): Class B, Style A.
2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
3. Notification Appliance Circuits (NAC): Class B, Style W.

D. Power Sources:

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
4. Each Computer System: Provide uninterruptible power supply (UPS).

2.2 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Where required, provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves.
2. Dry-pipe sprinkler system pressure.
3. Dry-pipe sprinkler valve room low temperature.
4. Elevator shut-down control circuits.

B. Alarm: Where required, provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.
2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
3. Duct smoke detectors.

C. Elevators: Where required, shall meet the following:

1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.

D. HVAC: Where required, shall meet the following:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

E. Doors: Where required, shall meet the following:

1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 08 71 00.
2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 08 71 00.

2.3 COMPONENTS

A. General:

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Addressable Modules:

1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.

D. Initiating Devices:

1. Addressable Systems:
   a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
   b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

E. Notification Appliances:

1. Bells: as indicated on drawings..
2. Horns/Speakers: as indicated on drawings..
3. Strobes: as indicated on drawings..

F. Circuit Conductors: Copper or optical fiber; provide 200 feet extra; color code and label.

G. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.

H. Locks and Keys: Deliver keys to Government.

I. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.

1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
2. Provide one for each control unit where operations are to be performed.

3. Obtain approval of Government prior to mounting; mount in location acceptable to Government.
4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. Obtain Government's approval of locations of devices, before installation.

D. Install instruction cards and labels.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. Notify Government 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.3 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Government.

1. Be prepared to conduct any of the required tests.
2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
5. Repeat demonstration until successful.

END OF SECTION 28 46 00

SECTION 31 10 00 - SITE CLEARING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.2 RELATED REQUIREMENTS

A. Section 01 57 23 - Storm Water Pollution Prevention.

B. Section 01 74 19 - Construction Waste Management and Disposal: Limitations on disposal of removed materials; requirements for recycling.

C. Section 02 41 00 - Demolition: Removal of built elements and utilities.

D. Section 31 22 00 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

E. Section 31 23 23 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.1 SITE CLEARING

A. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.2 EXISTING UTILITIES AND BUILT ELEMENTS

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Protect existing structures and other elements that are not to be removed.

3.3 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Do not remove or damage vegetation beyond the limits indicated on drawings.

C. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

D. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.

3.4 DEBRIS

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 10 00

SECTION 31 22 00 - GRADING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Removal of topsoil.

B. Rough grading the site for site structures.

C. Finish grading.

1.2 RELATED REQUIREMENTS

A. Section 31 10 00 - Site Clearing.

B. Section 31 23 23 - Fill: Filling and compaction.

C. Section 32 92 19 - Seeding: Finish ground cover.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the Work are as indicated.

B. Verify the absence of standing or ponding water.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum.

B. Stake and flag locations of known utilities.

C. Locate, identify, and protect from damage above- and below-grade utilities to remain.

D. Notify utility company to remove and relocate utilities.

E. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.

F. Protect site features to remain, including but not limited to bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs, from damage by grading equipment and vehicular traffic.

G. Protect trees to remain by providing substantial fencing around entire tree at the outer tips of its branches; no grading is to be performed inside this line.

H. Protect plants, lawns, rock outcroppings, and other features to remain as a portion of final landscaping.

3.3 ROUGH GRADING

A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.

B. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.

C. Do not remove wet subsoil, unless it is subsequently processed to obtain optimum moisture content.

D. When excavating through roots, perform work by hand and cut roots with sharp axe.

E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

F. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack surface water control.

3.4 SOIL REMOVAL

A. Stockpile topsoil to be re-used on site; remove remainder from site.

B. Stockpile subsoil to be re-used on site; remove remainder from site.

C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

3.5 FINISH GRADING

A. Before Finish Grading:

1. Verify building and trench backfilling have been inspected.
2. Verify subgrade has been contoured and compacted.

B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.

C. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.

D. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.

E. Maintain stability of topsoil during inclement weather. Replace topsoil in areas where surface water has eroded thickness below specifications.

3.6 TOLERANCES

A. Top Surface of Subgrade: Plus or minus 0.10 foot (1-3/16 inches) from required elevation.

B. Top Surface of Finish Grade: Plus or minus 0.04 foot (1/2 inch).

3.7 REPAIR AND RESTORATION

A. Existing Facilities, Utilities, and Site Features to Remain: If damaged due to this work, repair or replace to original condition.

B. Other Existing Vegetation to Remain: If damaged due to this work, replace with vegetation of equivalent species and size.

3.8 FIELD QUALITY CONTROL

A. See Section 31 23 23 for compaction density testing.

3.9 CLEANING

A. Remove unused stockpiled topsoil and subsoil. Grade stockpile area to prevent standing water.

B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION 31 22 00

SECTION 31 23 16.13 - TRENCHING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading: Site grading.

B. Section 31 23 16 - Excavation: Building and foundation excavating.

C. Section 31 23 23 - Fill: Backfilling at building and foundations.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. See Section 31 22 00 for additional requirements.

C. Locate, identify, and protect utilities that remain and protect from damage.

D. Notify utility company to remove and relocate utilities.

E. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

F. Protect plants, lawns, rock outcroppings, and other features to remain.

3.3 TRENCHING

A. Notify Contracting Officer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

B. Do not interfere with 45 degree bearing splay of foundations.

C. Cut trenches wide enough to allow inspection of installed utilities.

D. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See Section 31 23 16.13 for removal of larger material.

F. Remove excavated material that is unsuitable for re-use from site.

G. Stockpile excavated material to be re-used in area designated on site.

H. Stockpile excavated material to be re-used in area designated in Section 31 22 00.

I. Remove excess excavated material from site.

J. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Contracting Officer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 PREPARATION FOR UTILITY PLACEMENT

A. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

B. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

3.5 BACKFILLING

A. Backfill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Correct areas that are over-excavated.

F. Compaction Density Unless Otherwise Specified or Indicated:

1. At least 95 percent of maximum dry density in accordance with ASTM D1557.

G. Reshape and re-compact fills subjected to vehicular traffic.

3.6 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 ("modified Proctor"), AASHTO T 180, or ASTM D698 ("standard Proctor").

C. If tests indicate work does not meet specified requirements, remove work, replace and retest.

D. Frequency of Tests: Every 150 linear feet.

3.7 CLEANING

A. Leave unused materials in a neat, compact stockpile.

B. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 16.13

SECTION 31 23 16 - EXCAVATION

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Trenching for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

A. Section 01 57 23 - Temporary Storm Water Pollution Prevention.

B. Section 31 22 00 - Grading: Soil removal from surface of site.

C. Section 31 23 23 - Fill: Fill materials, backfilling, and compacting.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.

3.2 PREPARATION

A. Identify required lines, levels, contours, and datum locations.

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect plants, lawns, rock outcroppings, and other features to remain.

3.3 EXCAVATING

A. Excavate to accommodate construction operations.

1. Excavate to the specified elevations.
2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
3. Cut utility trenches wide enough to allow inspection of installed utilities.

B. Notify Contracting Officer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

C. Do not interfere with 45 degree bearing splay of foundations.

D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume. See 31 23 16.13 for removal of larger material.

E. Provide temporary means and methods, as required, to remove all water from excavations until directed by Contracting Officer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 SUBGRADE PREPARATION

A. See Section 31 23 23 for subgrade preparation at general excavations.

3.5 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. Install underground warning tape at buried utilities according to Sections 21 05 53, 22 05 53, 23 05 53, and 26 05 53.

C. See Section 31 23 23 for fill, backfill, and compaction requirements at general excavations.

3.6 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.7 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

3.8 CLEANING

A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 22 00.

B. Remove excavated material that is unsuitable for re-use from site.

C. Remove excess excavated material from site.

3.9 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION 31 23 16

SECTION 31 23 19 - DEWATERING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Installation.

B. Operation.

C. Water disposal.

D. Closeout activities.

1.2 RELATED REQUIREMENTS

A. Section 31 23 16 - Excavation.

B. Section 31 23 16.13 - Trenching.

1.3 REFERENCE STANDARDS

A. 29 CFR 1926 - U.S. Occupational Safety and Health Standards; current edition.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate dewatering with excavation.

1.5 SUBMITTALS

A. See Section 01 33 23 - Submittal Procedures.

B. Shop Drawings: Plans with equipment arrangement indicating collection and disposal areas.

C. Design Data: Include plans, elevations, sections, details, and calculations showing system certified by licensed professional.

D. Designer's qualification statement.

E. Installer's qualification statement.

F. Field Quality Control Submittals:

1. Document water level measurements.

1.6 QUALITY ASSURANCE

A. Designer Qualifications: Perform design under direct supervision of professional engineer experienced in design of this type of work and licensed in the State in which the Project is located.

B. Installer Qualifications: Company specializing in performing work of type specified and with at least 3 years of documented experience.

C. Documents at Project Site: Maintain at project site one copy of shop drawings.

1.7 FIELD CONDITIONS

A. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing.

B. Discharge Water: Comply with requirements, see Section 01 57 23 - Temporary Storm Water Pollution Prevention.

PART 3 EXECUTION

2.1 EXAMINATION

A. Preinstallation Testing: Measure prevailing groundwater level.

B. Verify survey bench mark elevations are as indicated on drawings.

C. Verification of Conditions:

1. Discharge area elevations and gradients.

2.2 PREPARATION

A. Provide surface water diversion controls guiding storm water away from excavations.

B. Protect from Dewatering Operations:

1. Stormwater Control: Protect requirements, see Section 01 57 23 - Temporary Storm Water Pollution Prevention.

2.3 INSTALLATION

A. Prevent fine sands from entering system or discharge.

B. Surface Water Control:

1. Install dewatering system in accordance with shop drawings to control surface water.
2. Prevent damages or disturbance to work from dewatering system.

C. Groundwater Control:

1. Install dewatering system in accordance with shop drawings to maintain groundwater levels below excavations.
2. Do not install system components within excavations.

D. Provide dewatering system standby equipment.

2.4 OPERATION

A. Operate system continuously or as directed by Contracting Officer.

B. Maintain excavations free of water until foundations, underground tanks, and underground utilities are constructed.

C. Prevent damages or disturbances to work areas from discharge water.

D. Maintain piezometric water level below excavation surface 24 inches, minimum.

E. Maintain standby equipment in operating order.

2.5 WATER DISPOSAL

A. Dispose of discharge water and collected sediment as directed by Contracting Officer.

B. Maintain water disposal system in operating order.

C. Prevent damages or disturbances to work areas from water disposal.

2.6 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Observation Wells: Install and maintain wells during dewatering operations.

1. Quantity and Location: According to Contracting Officer or discharge permit.
2. Water Depth Measurement Frequency: According to Contracting Officer or discharge permit.

2.7 CLOSEOUT ACTIVITIES

A. Dewatering System Removal: Remove upon completion of dewatering activities.

1. Equipment: Remove main and standby components.
2. Temporary Controls: Restore to previous conditions, remove controls, fill excavations, and smooth berms according to Contracting Officer.

2.8 PROTECTION

A. Protect installed dewatering system from subsequent construction operations.

B. Promptly repair dewatering system damages restoring operation.

END OF SECTION 31 23 19

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SECTION 31 23 23 - FILL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade.

B. Backfilling and compacting for utilities outside the building to utility main connections.

C. Lightweight concrete fill.

1.2 RELATED REQUIREMENTS

A. Section 01 57 23 - Temporary Storm Water Pollution Prevention.

B. Section 31 22 00 - Grading: Site grading.

C. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.

D. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2026.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

1.4 DELIVERY, STORAGE, AND HANDLING

A. When necessary, store materials on site in advance of need.

B. When fill materials need to be stored on site, locate stockpiles where designated by Contracting Officer.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Granular material, such as locally available river sand, that meets the requirements of AASHTO A-3.

B. Sand: In accordance with AASHTO A-3.

1. Non-plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight passing a U.S. Standard No. 200 mesh sieve.
2. The maximum organic content should not exceed 5% by weight.

C. Topsoil: Topsoil excavated on-site.

1. Graded.

2. Free of roots, rocks larger than 1/2 inch, subsoil, debris, large weeds and foreign matter.
3. Acidity range (pH) of 5.5 to 7.5.
4. Containing a minimum of 4 percent and a maximum of 25 percent inorganic matter.

D. Existing Gravel Stockpiles at Area 4

1. Existing gravel from the stockpiles located in Area 4 may be reused as fill within the same site following testing for gradation, overall quality, and contaminants. See section 2.2 for testing requirements.

2.2 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Existing gravel stockpiles testing at Area 4:

1. Gradation and overall quality to be tested by a geotechnical testing firm.
   a. The recommended testing for gradation and quality to meet the following specifications:
      1) Gradation - ASTM C136.
      2) Cleanliness - ASTM C117.
      3) Organic Impurities - ASTM C40.
      4) Abrasion - ASTM C131.
2. Contaminants to be tested by an environmental testing firm.
   a. The recommended testing for contaminants to meet the following specifications:
      1) Fecal Coliform/E. Coli testing - ASTM D5392 Standard Test Method for Isolation and Enumeration of E. Coli in water.
         (a) Contractor shall extract an aqueous rinse sample from the suspected gravel according to site sampling protocols and submit it to a certified laboratory. The laboratory shall analyze the sample for the presence and density of E. Coli using the membrane filter technique in strict accordance with ASTM D5392.
      2) Ammonia and Nitrate - ASTM 1426 Standard Test Method for Ammonia Nitrogen in Water.
         (a) To verify the presence of septic tank effluent, high-precision field test strips may be utilized for initial screening. Any positive indication of ammonia must be verified by collecting runoff water samples and analyzing them via Ion-Selective Electrode (ISE) or Direct Nesslerization in accordance with ASTM D1426, Test Method B.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.

B. Verify areas to be filled are not compromised with surface or ground water.

3.2 PREPARATION

A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.

B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.

C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.

D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.

B. Employ a placement method that does not disturb or damage other work.

C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.

D. Maintain optimum moisture content of fill materials to attain required compaction density.

E. Slope grade away from building minimum 2 inches in 10 feet, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

F. Correct areas that are over-excavated.

1. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

G. Compaction Density Unless Otherwise Specified or Indicated:

H. Reshape and re-compact fills subjected to vehicular traffic.

I. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Contracting Officer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.4 ENGINEERED FILL - LIGHTWEIGHT CONCRETE

A. Install lightweight concrete fill according to manufacturer's written instructions.

B. Use batching, mixing, and placing equipment approved by the manufacturer.

C. Prevent segregation of material.

D. Tolerance: Finished surface within 2 inches of elevation indicated on drawings.

3.5 FILL AT SPECIFIC LOCATIONS

A. Use general fill unless otherwise specified or indicated.

3.6 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.7 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.

B. Soil Fill Materials:

1. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
2. If tests indicate work does not meet specified requirements, remove work, replace and retest.
3. Frequency of Tests:
    a. Trench Backfill: At each compacted initial and final backfill layer, at least 1 test for each 150 feet or less of trench length, but no fewer than 2 tests.
    b. Paved Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 2,000 sq. ft. or less of paved area, but in no case fewer than 3 tests.
    c. Grassed and Landscaped Areas: At subgrade and at each compacted fill and backfill layer, at least 1 test for every 10,000 sq. ft. or less of grassed and landscaped area, but in no case fewer than 3 tests.

3.8 CLEANING

A. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 23 23

SECTION 31 25 00 - EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Temporary and permanment erosion and sediment control.

1.2 REFERENCE STANDARDS

A. ASTM D7367 - Standard Test Method for Determining Water Holding Capacity of Fiber Mulches for Hydraulic Planting; 2019, with Editorial Revision.

B. ASTM D8298/D8298M - Standard Test Method for Determination of Erosion Control Products (ECP) Performance in Protecting Slopes from Continuous Rainfall-Induced Erosion Using a Tilted Bed Slope; 2020.

C. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.

1.3 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data: Provide data on biodegradable erosion control matting, silt fence, and tree protection fencing.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP), whether the project is required by law to comply or not.

B. Comply with more stringent requirements of State of Louisiana Erosion and Sedimentation Control Manual.

2.2 MATERIALS

A. Woven Biodegradable Erosion Control Fabric:

1. Fabric Materials: 100% Coconut fiber, jute, or straw-coconut blends.
2. Weight/Mass: 8.7 oz/sy to 20 oz/sy per ASTM D6475.
3. Tensile Strength: 180 to 800 lbs/ft per ASTM D6818 or ASTM D4595.
4. Water Absorbency: Up to 450% per ASTM D1117.
5. Thickness: 0.20 in to 0.60 inc per ASTM D6525.

B. Silt Fence:

1. Geotextile Fabric : Must meet Louisiana Department of Transportation geotextile standards.
   a. Material: Woven or non-woven non-biodegradable, ultra violet-stabilized polypropylene.
   b. Strength: Tensile strength must be at least 120 lbs.
2. Posts and Support:

a. Posts: Minimum 4-1/2 foot hardwood or metal T-posts spaced at 8 feet to 10 feet on center.
b. Wire Backing: The fabric must be attached to a minimum 14-gauge welded wire with 4" x 4" mesh openings.

C. Tree Protection Fence:

1. Mesh material: heavy-duty, UV stabilized high-density polyethylene (HDPE) or vinyl plastic. Safety orange color.
   a. Mesh openings: standard 3.5" by 1.5" or oval cuts.
2. Posts: Heavy-duty steel T-posts, 6 feet in total length, drive at least 2 feet into ground.
   a. Maximum post spacing is 8 feet on center.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.2 PREPARATION

A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish documentation required to obtain applicable permits.

3.3 INSTALLATION

A. Woven Erosion Control Fabic Installation:

1. Grading and Clearing: Grade and shape the area, removing all rocks, roots, and clods. Fabric must have 100% direct contact with soil to prevent undercutting.
2. Trencing and Anchoring
   a. Dig a 6 inch by 6 inch trench along the top edge of the slope.
   b. Place the leading edge of the fabric inside the trench and secure it with biodegradable wodden stakes or metal staples spaced every 12 inches.
   c. Backfil the trench with soil and tamp it firmly to lock the edge in place.
3. Unrolling and Overlapping
   a. Unroll the fabric straight down the slope in the direction of water flow. Do not stretch material.
   b. Overlaps:
      1) Parallel (side by side): Overlap adjacent rolls by at least 3 to 4 inches.
      2) Vertical (end to end): Lay the upper roll on top of the lower roll (shingle style) with at least a 6 to 7 inch overlap.

B. Silt Fence Installation:

1. Bottom edge of fabric to be buried in a trench that is at least 4 inches deep and 4 inches wide.
2. Trench shall be backfilled and compacted securely with native soil.
3. Silt fence to be installed as shown in the Drawings.

C. Tree Protection Fence Installation:

1. Indentify location of structural roots prior to installation.
2. Stake location of fence and obtain approval for the location from the Contracting Officer prior to installation.
3. Do not drive on or otherwise compact soil in the critical root zone (CRZ) prior to installation.
4. Fencing must be placed at or beyond the CRZ. If fencing is to be located within the CRZ, excavate by hand or pneumatic excavator/air spade. Backfill excavation immmediately or cover roots with burlap and keep moist until backfill is complete.
5. Following the approval of the Contracting Officer for the location, drive steel T-posts directly into the ground at a minimum depth of 2 feet. Space posts no more than 8 feet on center.
6. Wrap the fencing material tightly around the outside of the posts. Secure the fabric to every post using heavy-duty plastic zip ties, steel wire ties, or fencing staples spaced every 12 inches vertically.

3.4 MAINTENANCE

A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.

B. Repair deficiencies immediately.

3.5 CLEAN UP

A. Clean out sediment from silt fence once sediment accumulates to one-third of the exposed fence height. Deposited soil must be spread out evenly within the site's designated upland areas or at a location directed by the Contracting Officer.

END OF SECTION 31 25 00

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SECTION 31 62 19 - TIMBER PILES

PART 1 GENERAL

1.1 REFERENCE STANDARDS

A. ASTM D25 - Standard Specification for Round Timber Piles; 2012 (Reapproved 2022).

B. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection; 2020.

C. AWPA M4 - Standard for the Handling, Storage, Field Fabrication and Field Treatment of Preservative-Treated Wood Products; 2023.

D. AWPA U1 - Use Category System: User Specification for Treated Wood; 2018.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY

A. Section includes round timber piles.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For timber piles. Show fabrication and installation details for piles, including details of driving shoes, tips or boots, and pile butt protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Round timber pile treatment data as follows, including chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material:

1. For each type of preservative-treated timber 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.

C. Pile-Driving Equipment Data: Include type, make, and rated energy range; weight of striking part of hammer; weight of drive cap; and, type, size, and properties of hammer cushion.

D. Pile-Driving Records: Submit within three days of driving each pile.

E. Certified Piles Survey: Submit within seven days of pile driving completion.

F. Field quality-control reports.

G. Material Certificates: For preservative-treated piles. Indicate type of preservative used and net amount of preservative retained.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1. Installer's responsibility includes engaging a qualified professional engineer to prepare pile-driving records.

B. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver piles to Project site in such quantities and at such times to ensure continuity of installation. Handle and store piles at Project site to prevent breaks, cuts, abrasions, or other physical damage and as required by AWPA M4.

1. Do not drill holes or drive spikes or nails into pile below cutoff elevation.

1.9 FIELD CONDITIONS

A. Protect structures, underground utilities, and other construction from damage caused by pile driving.

B. Site Information: A geotechnical report has been prepared for this Project and is referenced in the General Notes of the Structural Construction Drawings for information only.

PART 2 PRODUCTS

2.1 TIMBER PILES

A. Round Timber Piles: ASTM D25, unused, clean peeled, one piece from butt to tip; of the following species and size basis:

1. Species: As indicated in the Structural Construction Drawings.
2. Size Basis: Butt circumference based on pile butt and tip diameters indicated in the Structural Construction Drawings.

B. Pressure-treat round timber piles according to AWPA U1 as follows:

1. Service Condition: UC5C Marine Use Southern Waters
2. Treatment: Waterborne preservative

2.2 FABRICATION

A. Pile Butt: Trim pile butt and cut perpendicular to longitudinal axis of pile. Chamfer and shape butt to fit tightly to driving cap of hammer.

B. Field-Applied Wood Preservative: Treat field cuts, holes, and other penetrations according to AWPA M4.

1. Coal-tar roofing cement for treating drilled holes or sealing cutoffs shall be free of asbestos.

C. Pile Splices: Splices are not permitted.

D. Pile-Length Markings: Mark each pile with horizontal lines at 12-inch intervals; label the distance from pile tip at 60-inch intervals. Maintain markings on piles until driven.

PART 3 EXECUTION

3.1 EXAMINATION

A. Site Conditions: Do not start pile-driving operations until earthwork fills have been completed or excavations have reached an elevation of 6 to 12 inches above bottom of footing or pile cap.

3.2 DRIVING EQUIPMENT

A. Pile Hammer: Air-powered type capable of consistently delivering adequate peak-force duration and magnitude to develop the ultimate capacity required for type and size of pile driven and character of subsurface material anticipated.

1. Rated energy: 15,000 ft-lbs per blow
2. Maximum weight: 5,000 lbs
3. Maximum stroke drop: 3 feet

B. Hammer Cushions and Driving Caps: Between hammer and top of pile, provide hammer cushion and steel driving cap as recommended by hammer manufacturer and as required to drive pile without damage.

C. Leads: Use fixed, semifixed, or hanging-type pile-driver leads that hold the full length of pile firmly in position and in axial alignment with hammer.

3.3 DRIVING PILES

A. General: Continuously drive piles to elevations or penetration resistance indicated. Establish and maintain axial alignment of leads and piles before and during driving.

B. Spudding: Drive spud piles through overlying highly resistant strata or obstructions and withdraw for reuse.

C. Heaved Piles: Redrive heaved piles to tip elevation at least as deep as original tip elevation with a driving resistance at least as great as original driving resistance.

D. Driving Tolerances: Drive piles without exceeding the following tolerances, measured at pile heads:

1. Location: 3 inches from location indicated after pile driving is completed.
2. Plumb: Maintain 1 inch in 48 inches from vertical, or a maximum of 4 inches, measured when pile is aboveground in leads.
3. Batter Angle: Maximum 1 inch in 48 inches from required angle, measured when pile is aboveground in leads.

E. Withdraw damaged or defective piles and piles that exceed driving tolerances, and install new piles within driving tolerances.

1. Fill holes left by withdrawn piles as directed by Geotechnical Engineer.

F. Cut off butts of driven piles square with pile axis and at elevations indicated.

1. Cover cut-off piling surfaces with minimum three coats of preservative treatment according to AWPA M4.

G. Pile-Driving Records: Maintain accurate driving records for each pile, compiled and attested to by a qualified professional engineer. Include the following data:

1. Project name and number.
2. Name of Contractor.
3. Pile species.
4. Pile location in pile group and designation of pile group.
5. Sequence of driving in pile group.
6. Pile dimensions.
7. Ground elevation.
8. Elevation of tips after driving.
9. Final tip and cutoff elevations of piles after driving pile group.
10. Records of redriving.
11. Elevation of splices.
12. Type, make, model, and rated energy of hammer.
13. Weight and stroke of hammer.
14. Type of pile-driving cap used.
15. Cushion material and thickness.
16. Actual stroke and blow rate of hammer.
17. Pile-driving start and finish times, and total driving time.
18. Time, pile-tip elevation, and reason for interruptions.
19. Number of blows for every 12 inches of penetration, and number of blows per 1 inch for the last 6 inches of driving.
20. Pile deviations from location and plumb.
21. Unusual occurrences during pile driving.

H. Certified Piles Survey: Engage a land surveyor or professional engineer to prepare a piles survey showing final location of piles in relation to the property survey and existing benchmarks.

1. Notify Contracting Officer when deviations from locations exceed allowable tolerances.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: A qualified special inspector shall perform the applicable special inspections indicated in the Construction Documents:

B. Testing Agency: A qualified testing agency shall perform tests and inspections.

END OF SECTION 31 62 19

SECTION 32 11 20 - SUBBASE AND AGGREGATE BASE COURSES

PART 1 GENERAL

2.1 SECTION INCLUDES

A. Subbase course.

B. Aggregate base course.

2.2 RELATED REQUIREMENTS

A. Section 31 22 00 - Grading.

B. Section 32 12 16-Asphalt Paving

2.3 REFERENCE STANDARDS

A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2025.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)); 2012 (Reapproved 2021).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)); 2012 (Reapproved 2021).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

G. ASTM D3665 - Standard Practice for Random Sampling of Construction Materials; 2024.

H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

2.4 SUBMITTALS

A. See Section 01 33 23 - Submittal Procedures.

B. Test Reports:

1. Aggregate Composition: Results of laboratory tests on proposed and actual materials used.
2. Compaction Density: Results of laboratory tests on compacted course.

2.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

B. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions.

2.6 DELIVERY, STORAGE, AND HANDLING

A. See Section 01 74 19 - Construction Waste Management and Disposal for packaging waste requirements.

B. Aggregate Storage: Prevent material intermixing, contamination, and deterioration.

PART 2 PRODUCTS

3.1 MATERIALS

A. Subbase Course:

1. Select granular material, such as locally available river sand, meeting the requirements of AASHTO A-3.
2. Non plastic and free of roots, clay lumps, and other deleterious materials with no more than 10% by weight material passing the U.S. Standard N0. 200 mesh sieve.
3. Maximum organic content should not exceed 5% by weight.

B. Aggregate Base Course: conform to the requirements of the Louisiana State Standards for Roads and Bridges (LSSRB), Section 1003.03.1

1. Comply with State of Louisiana Highway Department standard.

3.2 SOURCE QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. If tests indicate materials do not meet specified requirements, change material and retest.

C. Provide materials of each type from same source throughout the Work.

D. For aggregate materials using classification complying with ASTM D2487, provide testing before delivery to site.

PART 3 EXECUTION

4.1 EXAMINATION

A. Verify that survey bench marks and intended elevations for the work are as indicated.

B. Verify substrate has been inspected, and gradients and elevations are correct and dry.

4.2 PREPARATION

A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

B. Do not place aggregate on soft, muddy, or frozen surfaces.

4.3 PLACEMENT

A. Spread course uniformly over prepared substrate to a total compacted thickness:

1. Subbase Thickness: According to design drawings.
2. Aggregate Base Thickness: According to design drawings.

B. Place course in maximum 4 inch layers and roller compact to specified density.

C. Level and contour surfaces to elevations and gradients indicated.

D. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

4.4 TOLERANCES

A. Variation From Design Elevation: Within 1/2 inch.

B. Flatness: Maximum variation of 1/2 inch measured with 10 foot straight edge.

4.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. Subbase Compaction Density Testing: In accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

C. Aggregate Base Compaction Density Testing: In accordance with ASTM D1556/D1556M, ASTM D2167, or ASTM D6938.

D. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D698 ("standard Proctor"), or ASTM D1557 ("modified Proctor").

E. Frequency of Tests: In accordance with ASTM D3665.

F. Remove, replace, and retest work that does not meet specified requirements.

G. Proof roll compacted aggregate at surfaces going underneath flexible paving.

4.6 CLEANING

A. See Section 01 77 00 - Closeout Requirements for additional requirements.

B. Stockpile unused materials neat and compact.

END OF SECTION 32 11 20

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SECTION 32 12 16 - ASPHALT PAVING

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Aggregate base course.

B. Heavy Duty Asphalt Paving.

C. Surface sealer.

D. Asphalt milling.

1.2 RELATED REQUIREMENTS

A. Section 32 11 20 - Subbase and Aggregate Base Courses.

1.3 REFERENCE STANDARDS

A. AI MS-2 - Asphalt Mix Design Methods; 2015.

1.4 SUBMITTALS

A. See Section 01 33 23 - Submittal Procedures.

B. Product Data:

1. Submit product data information for asphalt and aggregate materials.
2. Submit mix design with laboratory test results supporting data.
3. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Perform Work in accordance the Louisiana Standard Specifications for Roads and Bridges (LSSRB).

B. Mixing Plant: Complying with the LSSBR.

C. Obtain materials from same source throughout.

1.6 FIELD CONDITIONS

A. Do not place asphalt when ambient air or base surface temperature is less than 40 degrees F, or surface is wet or frozen.

PART 2 PRODUCTS

2.1 MATERIALS

A. Asphalt Cement: Shall conform to the LSSRB, Section 502.

B. Aggregate for Base Course: Shall conform to the LSSRB, Section 1003.03.1.

C. Primer: In accordance with the LSSBR

D. Tack Coat: Homogeneous, medium curing, liquid asphalt.

2.2 ASPHALT PAVING MIXES AND MIX DESIGN

A. Asphalt Base Course: mix design to meet the requirements of the LSSRB, Table 502-6.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify that compacted subgrade is dry and ready to support paving and imposed loads.

B. Verify gradients and elevations of base are correct.

3.2 AGGREGATE BASE COURSE

A. Place and compact aggregate base course.

3.3 PREPARATION - PRIMER

A. Apply primer in accordance with manufacturer's instructions.

B. Apply primer on aggregate base or subbase at uniform rate of 1/3 gal/sq yd.

C. Use clean sand to blot excess primer.

3.4 PREPARATION - TACK COAT

A. Apply tack coat in accordance with manufacturer's instructions.

B. Apply tack coat on asphalt or concrete surfaces over subgrade surface at uniform rate of 1/3 gal/sq yd.

3.5 PLACING ASPHALT PAVEMENT - HEAVY DUTY

A. Place asphalt binder course within 24 hours of applying primer or tack coat.

B. Place asphalt wearing course within two hours of placing and compacting binder course.

C. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

D. Perform rolling with consecutive passes to achieve even and smooth finish, without roller marks.

3.6 SEAL COAT

A. Apply seal coat to asphalt surface course and asphalt curbs in accordance with AI MS-19.

3.7 MILLING

A. In accordance with LSSRB, Section 509.

3.8 TOLERANCES

A. Flatness: Maximum variation of 1/4 inch measured with 10 foot straight edge.

B. Variation from True Elevation: Within 1/2 inch.

3.9 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for general requirements for quality control.

B. Provide field inspection and testing. Take samples and perform tests in accordance with AI MS-2.

3.10 PROTECTION

A. Immediately after placement, protect pavement from mechanical injury for 2 days or until surface temperature is less than 140 degrees F.

END OF SECTION 32 12 16

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SECTION 32 17 23 - PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Painted pavement markings.

1.2 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

1.3 REFERENCE STANDARDS

A. AASHTO M 249 - Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form); 2012 (Reapproved 2020).

B. AASHTO MP 24 - Standard Specification for Waterborne White and Yellow Traffic Paints; 2015 (Reapproved 2020).

C. ASTM D4505 - Standard Specification for Preformed Retroreflective Pavement Marking Tape for Extended Service Life; 2012 (Reapproved 2017).

D. FHWA MUTCD - Manual on Uniform Traffic Control Devices; 2023.

1.4 SUBMITTALS

A. See Section 01 33 23 for submittal procedures.

B. Product Data: Manufacturer’s data sheets on each product to be used.

C. Certificates: Submit for each batch stating compliance with specified requirements.

1. Painted pavement markings.

D. Manufacturer's Instructions:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

E. Manufacturer's qualification statement.

F. Installer's qualification statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience and approved by manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver paint in containers of at least 5 gallons accompanied by batch certificate.

B. Store products in manufacturer's unopened packaging until ready for installation.

1.7 FIELD CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.1 PAINTED PAVEMENT MARKINGS

A. Comply with Louisiana Department of Transportation standards.

B. Painted Pavement Markings: As indicated on drawings.

PART 3 EXECUTION

3.1 EXAMINATION

A. Identify existing markings for removal.

B. Verification of Conditions: Verify that pavement is dry and ready for installation.

C. Notify Contracting Officer of unsatisfactory conditions before proceeding.

3.2 PREPARATION

A. Place barricades, warning signs, and flags as necessary to alert approaching traffic.

B. Clean surfaces prior to installation.

1. Remove dust, dirt, and other debris.

3.3 INSTALLATION

A. General:

1. Position pavement markings as indicated on drawings.
2. Field location adjustments require approval of Contracting Officer.

B. Painted Pavement Markings:

1. Apply in accordance with manufacturer's instructions.
2. Apply in accordance with Louisiana Department of Transportation standards.

3.4 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements for additional requirements.

B. If inspections indicate work does not meet specified requirements, rework and reinspect at no cost to Government.

C. Allow the pavement marking to set at least the minimum time recommended by manufacturer.

3.5 PROTECTION

A. Prevent approaching traffic from crossing newly applied pavement markings.

END OF SECTION 32 17 23

SECTION 32 31 11 - GATE OPERATORS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Automatic vehicular swing gate operators, including:

1. Dual swing gate operators.
2. Solar photovoltaic power system.
3. Battery storage and charging equipment.
4. Gate operator controls.
5. Access control interface.
6. Vehicle detection loops and loop detectors.
7. Monitored entrapment protection devices.
8. Warning signs.
9. Emergency operation interface.
10. Wiring, conduit, connectors, mounting hardware, and accessories required for a complete operating system.

1.2 RELATED REQUIREMENTS

A. Section 32 12 16 - Asphalt Paving.

B. Section 26 00 50 – Common Work Results for Electrical

C. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables

D. Section 26 05 26 – Grounding and Bonding for Electrical Systems

E. Section 26 05 33.13 – Conduit for Electrical Systems

F. Section 26 05 33.16 – Boxes for Electrical Systems

1.3 REFERENCE STANDARDS

A. ANSI/CAN/UL 325 – Door, Drapery, Gate, Louver, and Window Operators and Systems.

B. ASTM F2200 – Standard Specification for Automated Vehicular Gate Construction.

C. ASTM F900 – Standard Specification for Industrial and Commercial Swing Gates.

D. NFPA 70 – National Electrical Code.

E. NFPA 780 – Standard for the Installation of Lightning Protection Systems, where applicable.

F. UFC 4-022-01 – Security Engineering: Entry Control Facilities / Access Control Points.

G. UFC 4-022-03 – Security Fences and Gates.

1.4 PERFORMANCE REQUIREMENTS

A. A. Provide a complete automatic vehicular gate operating system suitable for a normally-closed, dual-leaf swing gate.

B. Gate configuration:

1. Number of leaves: Two.
2. Leaf width: Approximately 15 feet each.
3. Maximum anticipated leaf weight: 800 pounds each.

4. Total gate opening: Approximately 30 feet.
5. Normal position: Closed.
6. Required operation: Automatic opening upon authorized access command and automatic closing following vehicle passage.
7. Design operating frequency: 100 complete open/close cycles per 24-hour period.

C. Operator shall be rated for the actual gate leaf width and weight without exceeding manufacturer's published capacity.

D. Operator shall be suitable for a minimum 100 complete open/close cycles per day under the specified solar operating conditions.

E. Operator shall be suitable for continuous commercial-duty service.

F. Operator shall be UL 325 listed and suitable for vehicular gate applications.

G. Operator shall provide monitored external entrapment protection and inherent obstruction detection.

H. Provide two independent means of entrapment protection at each applicable entrapment zone as required by UL 325 and the operator manufacturer's listing.

I. System shall provide synchronized operation of both gate leaves.

J. Gate shall remain closed following completion of the programmed close cycle unless a valid access command or emergency condition is received.

1.5 SUBMITTALS

A. See Section 01 33 23-Submittal Procedures.

B. Product Data:

1. Gate operator.
2. Control enclosure.
3. Solar panels.
4. Charge controller.
5. Batteries.
6. Keypad.
7. Loop detectors.
8. Photoelectric safety devices.
9. Warning devices and signs.

C. Shop Drawings:

1. Gate operator mounting locations.
2. Operator-to-gate connection details.
3. Solar panel location and orientation.
4. Battery arrangement.
5. Control enclosure.
6. Keypad location.
7. Vehicle loop layout.
8. Photoeye locations.
9. Conduit routing.

10. Grounding and bonding.
11. Wiring diagrams.
12. Terminal point schedules.
13. Access control interface.
14. Emergency access interface.
15. Gate operating sequence.

D. Solar Power Calculation:

Submit manufacturer's calculation demonstrating adequate solar charging capacity for a minimum of 100 complete open/close cycles per day.

Calculation shall account for:

1. Actual gate leaf weight.
2. Gate leaf width.
3. Gate opening angle.
4. Gate operating speed.
5. Daily cycle count.
6. Accessory current draw.
7. Battery storage capacity.
8. Site-specific solar insolation.
9. Worst-case seasonal solar conditions.
10. Panel orientation and tilt.
11. Anticipated shading.
12. Required reserve capacity.

E. Battery Calculation:

Submit battery sizing calculation demonstrating adequate stored energy to maintain required operation during periods of reduced solar availability.

F. UL 325 Documentation:

Submit manufacturer's documentation identifying the required entrapment protection devices and confirming compatibility with the specified operator.

G. Executed warranty.

1.6 QUALITY ASSURANCE

A. Gate operator installer shall be experienced in installation and commissioning of automatic vehicular gate operators of similar size and complexity.

B. Installer shall be trained or certified by the gate operator manufacturer.

C. Provide a complete operational and safety test following installation.

D. Coordinate operation and safety requirements with the Government's designated security and safety representatives.

1.7 WARRANTY

A. See Sections 01 77 00 – Closeout Procedures and 01 78 23 – Operation and Maintenance Data for additional warranty requirements.

B. Provide manufacturer's standard warranty, but not less than:

1. Operator and controls: Five years.
2. Solar charging equipment: Five years.
3. Batteries: Manufacturer's standard warranty.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufacturers:

1. Basis of Design: HySecurity SwingSmart DCS 20 Solar, https://hysecurity.com/products/swing-gate/swingsmart-dc/
2. The Basis of Design operator shall be a commercial-duty, pad-mounted, electromechanical swing gate operator capable of operating dual swing gate leaves.
3. Substitutions are allowed. Substitutions must be equal to or exceed Basis of Design products and meet the Salient Characteristics outlined in this specification. See section 01 33 23, paragraph 1.3.E for “Equal” product substitution procedures.

2.2 GATE OPERATORS

A. Provide two coordinated Solar operators, one operator for each gate leaf.

B. Minimum requirements:

1. Type: Electromechanical swing gate operator.
2. Power: 24 VDC.
3. Solar input: 24 VDC photovoltaic array.
4. Duty cycle: Minimum 100 cycles/day for solar configuration.
5. Gate leaf capacity: Minimum 800 pounds at 16-foot leaf.
6. Gate leaf width: Minimum 16 feet.
7. Operating speed: Adjustable approximately 10 to 15 seconds for opening or closing.
8. UL 325: Listed.
9. Usage classification: I, II, III, and IV.
10. Automatic dual-gate synchronization.
11. Adjustable open and close speed.
12. Adjustable obstruction sensitivity.
13. Battery backup.
14. Integral manual release.
15. Weather-resistant enclosure.
16. Lockable operator enclosure.

C. Operator shall include all required mounting brackets, gate connection hardware, controls, limit devices, wiring, and accessories required for a complete installation.

2.3 2.3 SOLAR POWER SYSTEM

A. Provide a complete photovoltaic charging system dedicated to the gate operator.

B. Minimum solar array capacity: 40 watts at 24 VDC.

C. Provide additional photovoltaic capacity when required by the manufacturer's submitted solar power calculation.

D. Provide MPPT or manufacturer-approved solar charge-control equipment compatible with the gate operator.

E. Solar array shall be located to provide unobstructed exposure to the sun throughout the design solar period.

F. Mount solar panel(s) on a corrosion-resistant steel or aluminum support structure.

G. Provide adjustable tilt and azimuth where required to obtain the manufacturer's recommended solar exposure.

H. Provide PV disconnect and overcurrent protection as required by the manufacturer and NFPA 70.

2.4 BATTERY SYSTEM

A. Provide two 12 VDC batteries connected in series to provide a 24 VDC nominal battery system.

B. Battery capacity: Minimum 50 Ah each unless the manufacturer's submitted power calculation demonstrates that a smaller capacity is adequate.

C. Batteries shall be deep-cycle, maintenance-free, sealed batteries approved by the gate operator manufacturer.

D. Provide battery enclosure and mounting hardware suitable for exterior installation.

E. Locate batteries to minimize exposure to direct solar heating and ambient temperatures exceeding manufacturer's recommendations.

2.5 ACCESS CONTROL KEYPAD

A. Provide exterior, vandal-resistant digital keypad for authorized vehicle entry.

B. Keypad shall:

1. Operate from the gate operator's available low-voltage power supply.
2. Provide dry-contact or manufacturer-compatible access command output.
3. Be suitable for exterior exposure.
4. Have weather-resistant enclosure.
5. Have illuminated or otherwise visible keys for nighttime operation.
6. Provide programmable access codes.
7. Include tamper-resistant mounting hardware.

C. C. Locate keypad a minimum of 6 feet beyond the gate swing path and in a location that allows a vehicle to stop clear of the gate while entering the access code.

D. D. Coordinate keypad location with site geometry, guard operations, accessibility requirements, and security requirements.

2.6 VEHICLE DETECTION

A. Provide vehicle detection loops and loop detectors as indicated on the drawings.

B. Provide manufacturer-compatible loop detectors.

C. Minimum functions:

1. Free-exit detection on secure side.
2. Gate safety/obstruction detection.
3. Approach detection where required by the operating sequence.

D. Provide separate loop functions where necessary to prevent an occupied detection zone from defeating the required safety or close sequence.

E. Loop detectors shall be solar-friendly and shall minimize continuous standby current.

F. Locate loops to prevent vehicles from being trapped between the gate leaves and fixed objects.

2.7 ENTRAPMENT PROTECTION

A. Provide monitored photoelectric entrapment protection devices compatible with the operator.

B. Photo eyes shall be continuously monitored by the operator.

C. Provide additional photo eyes and/or monitored sensing edges wherever an entrapment zone exists in either direction of gate travel.

D. Provide equipment such that failure, interruption, or loss of monitoring of an external entrapment device prevents normal automatic operation as required by UL 325.

E. Do not rely solely on vehicle loops for UL 325 entrapment protection.

2.8 EMERGENCY ACCESS

A. Provide dedicated emergency-open input compatible with the operator controller.

B. Coordinate emergency operation with the installation's fire department, emergency responder, and security requirements.

C. Emergency access shall override the normal closed/secured operating sequence when activated.

D. Provide fire/emergency access equipment and interface requirements shown on the drawings.

2.9 WARNING SIGNS

A. Provide UL 325-compliant warning signs on both sides of the automated gate.

B. Signs shall be permanently mounted and readily visible to pedestrians and vehicle occupants approaching the gate.

2.10 GROUNDING AND LIGHTNING PROTECTION

A. Ground and bond all exposed metallic components in accordance with NFPA 70, manufacturer requirements, and project grounding requirements.

B. Provide surge protection appropriate for solar-powered outdoor equipment.

C. Coordinate grounding and surge protection with the project's lightning protection system where provided.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install gate operators in accordance with manufacturer's written instructions.

B. Install operators on rigid foundations capable of resisting operating loads, wind loads, and impact loads imposed by the gate.

C. Gate leaves shall be properly aligned, plumb, balanced, and freely movable before operator installation.

D. Operator shall not be used to compensate for gate binding, excessive friction, inadequate hinges, or improper gate alignment.

E. Provide positive mechanical stops at fully open and fully closed positions.

F. Do not use the operator's internal limit mechanism as the sole means of mechanically stopping the gate.

3.2 SOLAR PANEL INSTALLATION

A. Install solar panels at an orientation and inclination determined by the manufacturer's solar power calculation.

B. Locate panels to avoid shading from:

1. Buildings.
2. Fences.
3. Gate structures.
4. Trees.
5. Utility poles.
6. Other site features.

C. Provide corrosion-resistant mounting hardware.

D. Provide conduit or protected cable routing between solar array and control enclosure.

3.3 WIRING

A. Provide conductors sized in accordance with manufacturer's requirements and NFPA 70.

B. Install all wiring in conduit except where manufacturer specifically permits listed direct-burial or exposed low-voltage cable.

C. Provide underground conduit crossings beneath vehicular pavement.

D. Provide warning tape above underground gate operator wiring.

E. Label all conductors at both ends.

F. Provide weatherproof junction boxes and fittings.

G. Seal conduit entries to outdoor enclosures against water and insect intrusion.

3.4 ACCESS CONTROL

A. Connect keypad to the operator's designated access-control input.

B. Configure keypad to provide an OPEN command following receipt of an authorized code.

C. Gate shall remain secured in the closed position following completion of the programmed close cycle.

D. Coordinate access codes with the Government's security representative.

3.5 VEHICLE DETECTION

A. Install loops in accordance with manufacturer's recommended dimensions and installation details.

B. Maintain loop conductors in continuous lengths without splices within the pavement unless specifically approved.

C. Provide loop detector settings appropriate to vehicle types anticipated at the installation.

D. Verify that loop detection does not interfere with required entrapment protection.

3.6 3.6 COMMISSIONING

A. Test each gate leaf independently.

B. Test synchronized operation.

C. Test:

1. OPEN command.
2. CLOSE command.
3. Keypad access.
4. Automatic close.
5. Vehicle detection.
6. Photoelectric entrapment protection.
7. Inherent obstruction detection.
8. Emergency-open operation.
9. Manual release.
10. Loss of solar charging.
11. Low-battery operation.
12. Battery backup.
13. Failure of each monitored safety device.
14. Gate stop positions.
15. Gate synchronization.
16. Warning signage.

D. Verify that failure of any monitored entrapment protection device prevents normal automatic operation as required by UL 325.

E. Demonstrate operation to the Government.

3.7 SOLAR SYSTEM ACCEPTANCE TEST

A. Demonstrate that the solar array is connected and charging the battery system.

B. Submit measured charging voltage and battery voltage.

C. Verify controller battery and solar status indications.

D. Demonstrate proper operation with solar charging disabled.

E. Submit final solar power calculation and commissioning report.

3.8 TRAINING

A. Provide minimum four hours of on-site training for Government maintenance personnel.

B. Training shall include:

1. Normal operation.
2. Manual gate release.
3. Controller diagnostics.

4. Battery replacement.
5. Solar system maintenance.
6. Photoeye testing.
7. Loop detector adjustment.
8. Keypad programming.
9. Emergency operation.
10. Troubleshooting.

3.9 CLOSEOUT DOCUMENTATION

A. See 01 78 23 – Operation and Maintenance Data for additional submittals.

B. See Section 01 77 00 – Closeout Procedures for additional requirements.

C. Submit:

1. Manufacturer's operation and maintenance manuals.
2. Final wiring diagrams.
3. Final gate operator settings.
4. Access-control programming information.
5. Solar power calculation.
6. Battery sizing calculation.
7. As-built loop locations.
8. Warranty documentation.
9. Factory training documentation.
10. Commissioning and acceptance test reports.

END OF SECTION 32 31 11

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SECTION 32 31 13 - CHAIN LINK FENCES AND GATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Posts, rails, and frames.

B. Wood bollard and chain fencing.

C. Concrete.

D. Manual gates with related hardware.

E. Automatic gate operators.

1.2 RELATED REQUIREMENTS

A. Section 03 30 00 - Cast-in-Place Concrete: Concrete anchorage for posts.

1.3 REFERENCE STANDARDS

A. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025.

B. ASTM F2200 - Standard Specification for Automated Vehicular Gate Construction; 2024.

C. CLFMI CLF-SFR0111 - Security Fencing Recommendations; 2014.

D. FS RR-F-191/1D - Fencing, Wire and Post Metal (Chain-Link Fence Fabric); 1990.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

F. UL 325 - Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.4 SUBMITTALS

A. See Section 01 33 23 for submittal procedures.

B. Product Data: Provide data on posts, accessories, fittings and hardware.

C. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components. Required for both chainlink and wood bollard and chain fencing.

D. Manufacturer's Qualification Statement.

E. Fence Installer Qualification Statement.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Fence Installer: Company with demonstrated successful experience installing similar projects and products, with not less than five years of documented experience.

1.6 WARRANTY

A. See Section 01 78 23-Operation and Maintenance Data for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.1 COMPONENTS

A. Line Posts: 1.9 inch diameter.

B. Corner and Terminal Posts: 2.38 inch diameter.

C. Fabric: 2 inch diamond mesh interwoven wire, 9 gauge, 0.1483 inch thick, top selvage knuckle end closed, bottom selvage twisted tight.

D. Tension Wire: 3/8 inch diameter steel, single strand.

E. Tie Wire: Aluminum alloy steel wire.

2.2 MATERIALS

A. Posts, Rails, and Frames:

1. Line Posts: Type I round in accordance with FS RR-F-191/1D.
2. Terminal, Corner, Rail, Brace, and Gate Posts: Type I round in accordance with FS RR-F-191/1D.

B. Concrete:

1. Ready-mixed, complying with ASTM C94/C94M; normal Portland cement; 3,500 psi strength at 28 days, 3 inch slump; 3/4 inch nominal size aggregate.

2.3 MANUAL GATES AND RELATED HARDWARE

A. Hardware for Double Swinging Gates: 180 degree hinges, 2 for gates up to 60 inches high, 3 for taller gates; drop bolt on inactive leaf engaging socket stop set in concrete, active leaf latched to inactive leaf preventing raising of drop bolt, padlock hasp; keepers to hold gate in fully open position.

B. Hinges: Finished to match fence components.

C. Latches: Finished to match fence components.

2.4 WOOD BOLLARD AND CHAIN FENCING

A. Wood bollards to match existing material, height, and diameter.

B. Metal chains to match existing material and gauge.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verification of Conditions: Verify that areas are clear of obstructions or debris.

3.2 PREPARATION

A. Removal: Obstructions or debris.

3.3 INSTALLATION

A. Install framework, fabric, accessories and gates in accordance with manufacturer's instructions.

B. Install operator in accordance with manufacturer's instructions and in accordance with NFPA 70.

3.4 TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch.

B. Maximum Offset From True Position: 1 inch.

3.5 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.

C. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

D. Gates: Inspect for level, plumb, and alignment.

3.6 CLEANING

A. Leave immediate work area neat at end of each work day.

B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.

C. Clean fence with mild household detergent and clean water rinse well.

D. Touch up scratched surfaces using materials recommended by manufacturer. Match touched-up paint color to factory-applied finish.

3.7 CLOSEOUT ACTIVITIES

A. See Section 01 78 23-Operation and Maintenance Data for closeout submittals.

END OF SECTION 32 31 13

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APPENDICES

A. Submittal List
B. Operation and Maintenance Requirements
C. Required Structural Test and Special Inspections

Submittal List with Review Estimate

National Park Service (NPS) - Denver Service Center (DSC) | 1-27-21

SUBMITTAL LIST											ACTION SUBMITTAL REVIEW ESTIMATE (Complete this portion for Architect / Engineer (A/E) construction service task order negotiation.)							
Park Acronym/Project Management Information System (PMIS) Number:																		
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SUBMITTAL			REQUIREMENTS (Indicate with **X**)								ARCHITECT / ENGINEER REVIEW TIME (Indicate in whole or partial hours.)							
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01 31 00	1.4.A	Coordination Drawings				X											
01 31 00	1.4.B	Coordination Drawing Organization				X											
01 31 00	1.4.C	Coordination Digital Data Files				X											
01 31 00	1.4.D	Division 1 Documents				X											
01 31 00	1.4.E	Provide items listed to Contracting Officer				X											
01 32 16	1.3.A	Electronic Copies				X											
01 32 16	1.3.B	Schedule of Values				X											
01 32 16	1.3.C	Construction Baseline Schedule				X											
01 32 16	1.3.D	Critical Path Method (CPM) Reports				X											
01 32 16	1.3.E	Construction Schedule Updates				X											
01 32 16	1.3.F	Construction Schedule Revisions and Time Impact Analysis				X											
01 32 33	1.2.A	Selective Demolition and Construction Images				X											
01 32 33	1.2.B	Submit complete set of digital images for closeout				X											
01 35 13.22	1.3.A	Daily Work Schedule				X											
01 35 23	1.3.A	Accident Prevention Plan (APP)				X											
01 35 23	1.3.B	Severe Weather Plan (SWP)				X											
01 40 00	1.4.A	Quality Control Plan				X											
01 40 00	1.4.B	Qualification Data				X											
01 40 00	1.4.C	Contractor Quality Control (CQC)				X											
01 40 00	1.4.D	Test Reports				X											
01 40 00	1.4.E	Accessibility Inspection Report				X											
01 40 00	1.4.F	Off-Site Inspection Reports				X											
01 40 00	1.4.G	Contractor's Quality Control Daily Reports				X											
01 40 00	1.4.H	Permits, Licenses, and Certifications				X											
01 57 19.11	1.4.A	Indoor Air Quality (IAQ) Management Plan				X											
01 57 19.11	1.4.B	Product Data			X												
01 57 19.11	1.4.C	Inspection and Test Reports		X													
01 57 23	1.3.A.1	UPPP		X													
01 57 23	1.3.B	Inspection Schedule: Pollution Prevention Measures		X													
01 57 23	1.3.C	Inspection Schedule: Storm Water Pollution Prevention Measures		X													
01 57 23	1.3.D	Erosion Control Products			X												

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01 67 00	1.3.A.1	Affirmation Procurement Reporting Form				X												
01 67 00	1.3.A.2	Environmental Data				X												
01 67 00	1.3.A.3	Material Safety Data Sheets (MSDS)				X												
01 67 00	1.3.A.4	Chain of Custody				X												
01 73 29	1.2.A	Cutting and Patching Plan		X														
01 73 40	1.2.A	Certificates				X												
01 73 40	1.2.B	Landfill Receipts				X												
01 73 40	1.2.C	Certified Surveys				X												
01 73 40	1.2.D	Quantity Surveys				X												
01 74 19	1.4.A	Waste Management Plan				X												
01 74 19	1.4.B	Progress Documentation				X												
01 74 19	1.4.C	Waste Reduction Calculations				X												
01 74 19	1.4.D	Records of Donations				X												
01 74 19	1.4.E	Records of Sales				X												
01 74 19	1.4.F	Recycling and Processing Facility Records				X												
01 74 19	1.4.G	Landfill and Incinerator Disposal Records				X												
01 74 19	1.4.H	Qualification Data				X												
01 74 19	1.4.I	Statement of Refrigerant Recovery				X												
01 74 19	1.4.J	Progress Payment Requirements				X												
01 74 19	1.4.K	Closeout Submittals				X												
01 77 00	1.3	Closeout Submittals				X												
01 78 23	1.2.A	Manuals			X													
01 79 00	1.3.A	Instruction Program		X														
01 79 00	1.3.B	Demonstration and Training Video		X														
01 91 14	1.6.A	Two-week look-ahead schedules		X														
01 91 14	1.6.B	Certificates of Readiness				X												
01 91 14	1.6.C	Contractor's Commissioning Representative Qualifications				X												
01 91 14	1.6.D	Commissioning Plan		X														
01 91 14	1.6.E	Pre functional Checklists				X												
01 91 14	1.6.F	Owner's Project Requirements	X															
01 91 14	1.6.G	Functional Performance Test Forms	X															
01 91 14	1.6.H	List of Test Instrumentation, Equipment, and Monitoring Devices	X															
01 91 14	1.6.I	Deficiency Report and Resolution Record		X														
01 91 14	1.6.J	Closeout Documentation				X												

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02 41 00	1.4.B	Site Plan		X														
02 41 00	1.4.C	Demolition Plan		X														
02 41 00	1.4.D	Project Record Documents				X												
03 30 00	1.5.A	Design Mixtures								X								
03 30 00	1.5.B	Cold-Weather Placement								X								
03 30 00	1.5.C	Hot-Weather Placement								X								
03 30 00	1.5.D	Steel Reinforcement Shop Drawings						X										
03 30 00	1.5.E	Formwork Layout and Dimension Shop Drawings						X										
03 30 00	1.5.F	Material Test Reports							X									
03 30 00	1.5.G	Material Certificates						X										
03 30 00	1.5.H	Minutes of Preinstallation Conference								X								
05 12 00	1.5.A	Product Data							X									
05 12 00	1.5.B	Shop Drawings						X										
05 12 00	1.6.A	Qualification Data	X															
05 12 00	1.6.B	Welding Certificates	X															
05 12 00	1.6.C	Material (Mill) Test Reports for Structural Steel		X														
05 12 00	1.6.D	Product Test Reports		X														
05 12 00	1.6.E	Source Quality-Control Reports		X														
05 12 00	1.6.F	Survey of Existing Conditions		X														
05 40 00	1.5.A	Product Data							X									
05 40 00	1.5.B	Shop Drawings						X										
05 40 00	1.5.C	Delegated - Design Submittal								X								
05 40 00	1.5.D	Structural Design Calculation								X								
05 40 00	1.6.A	Welding Certificates	X															
05 53 00	1.4.B	Product Data							X									
05 53 00	1.4.C	Shop Drawings						X										
05 53 00	1.4.D	Manufacturer's Installation Instructions							X									
06 10 00	1.5.A	Product Data							X									
06 16 00	1.4.A	Product Data							X									
06 20 00	1.5.B	Product Data							X									
06 20 00	1.5.C	Shop Drawings						X										
06 20 00	1.5.D	Samples					X											
06 20 00	1.5.E	Samples					X											
06 41 00	1.4.B	Shop Drawings						X										

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06 41 00	1.4.C	Product Data							X									
07 21 00	1.4.B	Product Data							X									
07 21 00	1.4.C	ABAA Field Quality Control Submittals								X								
07 21 00	1.4.D	ABAA Manufacturer Qualification	X															
07 21 00	1.4.E	ABAA Installer Qualifications	X															
07 62 00	1.4.B	Shop Drawings						X										
07 92 00	1.4.B	Product Data for Sealants							X									
07 92 00	1.4.C	Color Cards for Selections							X									
07 92 00	1.4.D	Preconstruction Laboratory Test Reports	X															
07 92 00	1.4.E	Preinstallation Field Adhesion Test Plan		X														
07 92 00	1.4.F	Field Quality Control Plan		X														
07 92 00	1.4.G	Preinstallation Field Adhesion Test Reports		X														
07 92 00	1.4.H	Field Quality Control Log		X														
08 11 13	1.5.B	Product Data							X									
08 11 13	1.5.C	Shop Drawings						X										
08 14 16	1.4.B	Product Data							X									
08 14 16	1.4.C	Shop Drawings						X										
08 14 16	1.4.D	Warranty				X												
08 43 13	1.4.B	Product Data							X									
08 43 13	1.4.C	Shop Drawings						X										
08 51 23	1.4.B	Product Data							X									
08 51 23	1.4.C	Shop Drawings						X										
08 51 23	1.4.D	Warranty				X												
08 71 00	13.1	Product Data							X									
08 71 00	13.2	Riser and Wiring Diagrams						X										
08 71 00	13.3	Samples for Verifications					X											
08 71 00	13.4	Door Hardware Schedule								X								
08 71 00	13.5	Key Schedule								X								
08 71 00	14.1	Qualification Data	X															
08 71 00	14.2	Product Data			X													
08 71 00	15.1	Operations & Maintenance Data			X													
08 80 00	1.5.B	Product Data							X									
08 80 00	1.5.C	Product Data							X									
08 80 00	1.5.D	Samples					X											

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08 80 00	1.5.E	Manufacturer's Qualification Statement	X															
08 80 00	1.5.F	Installer's Qualification Statement				X												
08 80 00	1.5.G	Warranty Documentation				X												
08 80 00	1.5.H	Maintenance Materials								X								
08 88 00	1.5.B	Product Data							X									
09 05 61	1.4.A	Visual Observation Report		X														
09 05 61	1.4.B	Product Data							X									
09 21 16	1.4.B	Product Data							X									
09 21 16	1.4.C	Product Data							X									
09 30 00	1.4.B	Product Data							X									
09 30 00	1.4.C	Shop Drawings						X										
09 30 00	1.4.D	Maintenance Data							X									
09 30 00	1.4.E	Maintenance Materials								X								
09 51 00	1.4.B	Shop Drawings						X										
09 51 00	1.4.C	Product Data							X									
09 51 00	1.4.D	Maintenance Materials								X								
09 67 00	1.2.B	Product Data							X									
09 91 00	1.3.A	Product Data							X									
09 91 00	1.3.B	Samples					X											
09 91 00	1.3.C	Maintenance Data							X									
09 91 00	1.3.D	Maintenance Materials								X								
09 91 23	1.3.A	Product Data							X									
09 91 23	1.3.B	Samples					X											
09 91 23	1.3.C	Manufacturer's Instructions							X									
09 91 23	1.3.D	Maintenance Data							X									
09 91 23	1.3.E	Maintenance Materials								X								
10 14 00	1.3.B	Product Data							X									
10 14 00	1.3.C	Signage Schedule								X								
10 14 00	1.3.D	Samples					X											
10 14 00	1.3.E	Selection Samples					X											
10 28 00	1.4.B	Product Data							X									
10 28 00	1.4.C	Manufacturer's Installation Instructions							X									
10 51 13	1.4.B	Product Data							X									
10 51 13	1.4.C	Shop Drawings						X										

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10 73 16.13	1.4.B	Product Data							X									
10 73 16. 13	1.4.C	Shop Drawings						X										
10 73 16. 13	1.4.D	Design Data								X								
10 73 16. 13	1.4.E	Warranty				X												
12 24 00	1.5.A	Product Data							X									
12 24 00	1.5.B	Shop Drawings						X										
12 24 00	1.5.C	Source Quality Control Submittals					X											
12 24 00	1.5.D	Selection Samples					X											
12 24 00	1.5.E	Verification Samples					X											
12 24 00	1.5.F	Manufacturer's Instructions							X									
12 24 00	1.5.G	Operation and Maintenance Data							X									
12 24 00	1.5.H	Warranty				X												
12 32 00	1.6.B	Product Data							X									
12 32 00	1.6.C	Shop Drawings						X										
12 32 00	1.6.D	Samples for finish selection					X											
12 32 00	1.6.E	Casework Samples					X											
12 32 00	1.6.F	Manufacturer's Qualification Statement	X															
12 32 00	1.6.G	Installer's Qualification Statement				X												
12 32 00	1.6.H	Maintenance Data							X									
12 32 00	1.6.I	Maintenance Materials								X								
12 32 00	1.6.J	Finish touch-up kit								X								
12 36 00	1.4.A	Product Data							X									
12 36 00	1.4.B	Shop Drawings						X										
12 36 00	1.4.C	Selection Samples					X											
12 36 00	1.4.D	Verification Samples					X											
12 36 00	1.4.E	Test Reports		X														
12 36 00	1.4.F	Certificate	X															
12 36 00	1.4.G	Installation Instructions			X													
12 36 00	1.4.H	Maintenance Data							X									
21 05 48	1.6.B.1	Design Documents								X								
21 05 48	1.6.B.2	Product Data							X									
21 05 48	1.6.B.3	Shop Drawings: Seismic Design Data						X										
21 05 53	1.3.B	Product Data							X									
21 05 53	1.3.B.2	Samples					X											

SUBMITTAL LIST

Park Acronym/Project Management Information System (PMIS) Number:

Project Title:

ACTION SUBMITTAL REVIEW ESTIMATE

(Complete this portion for Architect / Engineer (A/E) construction service task order negotiation.)

SUBMITTAL			REQUIREMENTS (Indicate with **X**)								ARCHITECT / ENGINEER REVIEW TIME (Indicate in whole or partial hours.)							
			INFORMATIONAL				ACTION											
SPECIFICATION SECTION	PARAGRAPH NUMBER	DESCRIPTION	CERTIFICATIONS OR LABORATORY TESTS	REPORTS OR CALCULATIONS OR PLAN	MANUFACTURER DATA AND INSTRUCTIONS	OTHER	SAMPLES	SHOP DRAWINGS	MANUFACTURER DATA AND INSTRUCTIONS	OTHER		ARCHITECT	CIVIL ENGINEER	STRUCTURAL ENGINEER	MECHANICAL ENGINEER	ELECTRICAL ENGINEER	PROJECT MANAGER COORDINATION	LANDSCAPE ARCHITECT
21 13 00	1.5.B.1.A	Product Data							X									
21 13 00	1.5.B.1.B	Shop Drawings						X										
21 13 00	1.5.B.2	Approved Shop Drawings						X										
21 13 00	1.5.C.1	Operation and Maintenance Data			X													
21 13 00	1.5.C.2	Maintenance Materials				X												
21 13 00	1.5.C.3	Project Record Documents				X												
22 00 50	1.9.D.1	Plumbing Operations Test Reports		X														
22 00 50	1.9.D.2	Sterilization Test Reports		X														
22 05 19	1.3.B	Product Data							X									
22 05 23	1.5.B	Product Data							X									
22 05 48	1.5.B	Product Data							X									
22 07 19	1.4.B	Product Data							X									
22 10 05	1.4.B	Product Data							X									
22 10 06	1.4.B	Product Data							X									
22 13 19	1.4.B	Product Data							X									
22 30 00	1.4.B	Product Data							X									
22 30 00	1.4.C	Operation and Maintenance Data			X													
22 30 00	1.4 .D	Warranty				X												
22 40 00	1.3.B	Product Data							X									
23 00 50	1.7.C	Shop Drawings						X										
23 05 17	1.4.A	Product Data							X									
23 05 23	1.4.B	Product Data							X									
23 05 29	1.5.B	Product Data							X									
23 05 29	1.5.C	Shop Drawings							X									
23 05 29	1.5.D	Manufacturer's Instructions						X										
23 05 93	1.4.B	TAB Plan							X									
23 05 93	1.4.C	Field Logs				X												
23 05 93	1.4.D	Control System Coordination Reports		X														
23 05 93	1.4.E	Final Report		X														
23 07 13	1.5.B	Product Data							X									
23 07 13	1.5.C	Shop Drawings						X										
23 07 19	1.4.B	Product Data							X									
23 21 13	1.5.B	Product Data							X									
23 21 14	1.4.B	Product Data							X									

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			INFORMATIONAL				ACTION											
SPECIFICATION SECTION	PARAGRAPH NUMBER	DESCRIPTION	CERTIFICATIONS OR LABORATORY TESTS	REPORTS OR CALCULATIONS OR PLAN	MANUFACTURER DATA AND INSTRUCTIONS	OTHER	SAMPLES	SHOP DRAWINGS	MANUFACTURER DATA AND INSTRUCTIONS	OTHER		ARCHITECT	CIVIL ENGINEER	STRUCTURAL ENGINEER	MECHANICAL ENGINEER	ELECTRICAL ENGINEER	PROJECT MANAGER COORDINATION	LANDSCAPE ARCHITECT
23 23 00	1.4.B	Product Data							X									
23 25 00	1.4.B	Product Data							X									
23 31 00	1.4.B	Product Data							X									
23 31 00	1.4.C	Shop Drawings						X										
23 33 00	1.4.B	Product Data							X									
23 33 00	1.4.C	Project Record Documents		X														
23 34 16	1.4.B	Product Data							X									
23 37 00	1.4.B	Product Data							X									
23 64 00	1.3.B	Shop Drawings						X										
23 64 00	1.3.C	Manufacturer's Installation Instructions			X													
23 64 00	1.3.D	Operation and Maintenance Data			X													
23 73 10	1.6.A	Unit performance data			X													
23 73 10	1.6.B	Mechanical Specifications				X												
23 73 10	1.6.C	Shop Drawings						X										
23 73 10	1.6.D	Fan curves with specified operating point clearly plotted				X												
23 73 10	1.6.E	Product Data							X									
23 81 29	1.6.B	Product Data							X									
23 81 29	1.6.C	Refrigerant System Pressure Test		X														
26 00 50	1.6.A	Shop Drawings and Product Data						X	X									
26 00 50	1.6.E	Record Documents								X								
26 05 48	1.5.B	Design Documents						X										
26 05 48	1.5.C	Product Data							X									
26 05 48	1.5.D	Seismic Design Data							X									
26 05 48	1.5.E	Certification of seismically qualified equipment	X															
26 05 48	1.5.F	Evaluation Reports		X														
26 05 48	1.5.G	Manufacturer's detailed field testing		X														
26 05 48	1.5.H	Field quality control test reports		X														
26 05 73	1.5.B	Study Reports		X														
26 05 73	1.5.C	Product Data							X									
26 05 73	1.5.D	Arc Flash Hazard Warning Label Samples					X											
26 05 73	1.5.E	Site-Specific arc flash hazard warning labels				X												
26 05 73	1.5.F	Certification	X															
26 24 16	1.4.B	Product Data							X									
26 27 13	1.3.B	Product Data							X									

SUBMITTAL LIST

Park Acronym/Project Management Information System (PMIS) Number:

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			INFORMATIONAL				ACTION											
SPECIFICATION SECTION	PARAGRAPH NUMBER	DESCRIPTION	CERTIFICATIONS OR LABORATORY TESTS	REPORTS OR CALCULATIONS OR PLAN	MANUFACTURER DATA AND INSTRUCTIONS	OTHER	SAMPLES	SHOP DRAWINGS	MANUFACTURER DATA AND INSTRUCTIONS	OTHER		ARCHITECT	CIVIL ENGINEER	STRUCTURAL ENGINEER	MECHANICAL ENGINEER	ELECTRICAL ENGINEER	PROJECT MANAGER COORDINATION	LANDSCAPE ARCHITECT
26 27 26	1.5.B	Product Data							X									
26 28 13	1.4.B	Product Data							X									
26 28 16.16	1.5.B	Product Data							X									
26 51 00	1.5.B	Product Data							X									
26 56 00	1.5.B	Shop Drawings						X										
26 56 00	1.5.C	Product Data							X									
26 56 00	1.5.D	Certificates	X															
26 56 00	1.5.E	Operation and Maintenance Data			X													
28 46 00	1.3.B	Proposal Documents				X												
28 46 00	1.3.C	Evidence of designer qualifications	X															
28 46 00	1.3.D	Design Documents				X												
28 46 00	1.3.E	Evidence of installer qualifications	X															
28 46 00	1.3.F	Inspection and Test Reports		X														
28 46 00	1.3.G	Operation and Maintenance Data			X													
28 46 00	1.3.H	Project Record Documents			X													
28 46 00	1.3.I	Closeout Documents				X												
31 23 19	1.5.B	Shop Drawings						X										
31 23 19	1.5.C	Design Data								X								
31 23 19	1.5.D	Designer's qualification statement	X															
31 23 19	1.5.E	Installer's qualification statement	X															
31 23 19	1.5.F	Field Quality Control Submittal			X													
31 62 19	1.5.A	Product Data							X									
31 62 19	1.5.B	Shop Drawings						X										
31 62 19	1.6.A	Qualification Data	X															
31 62 19	1.6.B	Round Timber Pile Treatment Data		X														
31 62 19	1.6.C	Pile-Driving Equipment Data				X												
31 62 19	1.6.D	Pile-Driving Records		X														
31 62 19	1.6.E	Certified Piles Survey				X												
31 62 19	1.6.F	Field Quality-Control Reports		X														
31 62 19	1.6.G	Material Certifications	X															
32 11 20	1.4.B	Test Reports		X														
32 17 23	1.4.B	Product Data							X									
32 17 23	1.4.C	Certificates	X															
32 17 23	1.4.D	Manufacturer's Instructions			X													

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Park Acronym/Project Management Information System (PMIS) Number:

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			INFORMATIONAL				ACTION											
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32 17 23	1.4.E	Manufacturer's Qualification Statement			X													
32 17 23	1.4.F	Installer's Qualification Statement	X															
32 31 11	1.5.B	Product Data							X									
32 31 11	1.5.C	Shop Drawings						X										
32 31 11	1.5.D	Solar Power Calculation								X								
32 31 11	1.5.E	Battery Calculation				X				X								
32 31 11	1.5.F	UL 325 Documentation				X												
											Total:	0	0	0	0	0	0	0

Closeout and Operation & Maintenance (O&M) Requirements

NPS JELA 325249 Jones Point

Topic	Specification Section	Requirement	Submittal Date	Completed	Received by Park
Project Record Drawings	024100	Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction			
	211300	Project Record Documents: Record actual location sprinklers and deviations			
	284600	Project Record Documents: Record actual location devices and deviations			
	323111	As-Built Loop Locations			
System Demonstration and Training	017700	Closeout - Posted Operating Instructions			
	017900	Demonstration and Training - Instruction Program			
	017900	Demonstration and Training Videos			
	211300	Sprinkler System Training Documents			
	284600	Fire Alarm System Demostration and Training			
	323111	Gate System Operational Training			
Tools Spare Parts Equipment	123200	Finish touch-up kit for each type and color of materials provided.			
	123553.19	Finish touch-up kit for each type and color of materials provided.			
Extra Stock	093000	Tiling - Extra Tile: 10 square feet of each size, color, and surface finish combination.			
	099113	Exterior Paint - Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.			
	099113	Exterior Paint - Label each container with color in addition to the manufacturer's label.			
	099123	Interior Paint - Extra Paint and Finish Materials: 1 gallon of each color; from the same product run, store where directed.			
	099123	Interior Paint - Label each container with color in addition to the manufacturer's label.			
	211313	Sprinkler System - The contractor must provide spare sprinklers, sprinkler wrench and sprinkler cabinet in accordance with NFPA 13.			
Reports	013233	Photo Documentation - Closeout - Submit complete set of digital image electronic files			
	017419	Construction Waste Management & Disposal - Project Waste Management Plan Summary Worksheet			
	017700	Closeout - NPS required forms for occupancy, Fire Sprinkler/Alarm acceptance, and other similar forms or certificates.			
	017700	Closeout - Test and Balance Report			
	019114	Building Commisioning - Closeout Documentation			
	220050	Plumbing System Operational Test Report			
	220050	Sterilization Test Report			
	230593	Final TAB Report			
Keys & Keying Schedule	017700	Closeout - Keys & Keying Schedule			
O&M Data Warranties Guarantees	017700	Closeout - Environmental Record Documents			
	017823	Manuals			
	019114	Commissioning - Start-up certificates for commissioned equipment with start-up requirements			
	019114	Pre functional Checklists			
	019114	Owner's Project Requirements			
	019114	Functional Performance Test Forms			
	019114	List of Test Instrumentation, Equipment, and Monitoring Devices			
	019114	Deficiency Report and Resolution Record			
	019114	Closeout Documentation			
	079200	Warranty Documentation			
	081416	Warranty Documentation			
	084313	Warranty Documentation			
	085123	Warranty Documentation			
	087100	Operations & Maintenance Data			
	087100	Warranty Documentation			
	088000	Warranty Documentation			
	099113	Exterior Paint - Maintenance Data			
	099123	Interior Paint - Maintenance Data			
	104400	Fire Protection Specialties - Maintenance Data: Include test, refill or recharge schedules and re-certification requirements.			

Topic	Specification Section	Requirement	Submittal Date	Completed	Received by Park
	107316.13	Warranty Documentation			
	113013	Residential Appliances - Copies of Warranties			
	122400	Warranty Documentation			
	123200	Warranty - Corrective Work			
	123553.19	Warranty Documentation			
	123600	Countertops - Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.			
	211300	Sprinkler Operation and Maintenance Data			
	211300	Sprinkler Operation and Maintenance Material			
	223000	Operation and Maintenance Data			
	223000	Warranty Documentation			
	236400	Operations & Maintenance Manuals			
	236400	Warranty Documentation			
	237310	Warranty Documentation			
	238129	Warranty Documentation			
	262416	Panelboard Maintenance Data			
	265100	Operation and Maintenance Data			
	265100	Warranty Documentation			
	265600	Operation and Maintenance Data			
	265600	Warranty Documentation			
	284600	Operation and Maintenance Data			
	284600	Warranty Documentation			
	323111	Warranty Documentation			

Statement of Structural Tests and Special Inspections

National Park Service (NPS) - Denver Service Center (DSC) | 8-22-24

Park: Jean Lafitte National Historic Park and Preserve

Project Management Information System (PMIS) Number: 325249

Project Name: Barataria Preserve

Structural Engineering Firm: PES Structural Engineers

This Statement of Structural Tests and Special Inspections is being submitted as required by Chapter 17 of the **2024 International Building Code** (IBC 2024). It includes the following:

1. Seismic requirements
2. Wind requirements
3. Qualification Requirements for Inspectors and Testing Technicians
4. Listing of Required Structural Tests and Special Inspections

The Construction Contractor's Quality Control Supervisor will provide copies of all special inspection reports and associated documentation to the Contracting Officer (CO). The Construction Contractor will be required to correct all deficiencies discovered in the Special Inspection and Structural Testing program.

Prepared By: John O'Brien, P.E., S.E.
(Type or print name)

Signature: SEALED BELOW Date: August 21st, 2026

THIS ITEM HAS BEEN DIGITALLY SIGNED AND SEALED BY JOHN O'BRIEN, P.E., S.E.] ON THE DATE ADJACENT TO THE SEAL.
THE SIGNATURE MUST BE VERIFIED ON ANY ELECTRONIC COPIES.

Stamped by Professional Engineer (PE) or Structural Engineer (SE)

Seismic and Wind Requirements

Seismic Requirements, IBC 2024 Section 1704.3

Description of seismic-force-resisting system and designated seismic systems subject to special inspections:

Area 1 – Education Center

- SFRS: Existing construction – proposed Work does not modify the existing SFRS and does not require Special Inspection
- Designated Systems: Not applicable for SDC B per IBC 1705.13.4

Area 2 – Admin Building – Former VC

- SFRS: Existing construction – proposed Work does not modify the existing SFRS and does not require Special Inspection
- Designated Systems: Not applicable for SDC B per IBC 1705.13.4

Area 2 – Law Enforcement

- SFRS: Existing construction – proposed Work does not modify the existing SFRS and does not require Special Inspection
- Designated Systems: Not applicable for SDC B per IBC 1705.13.4

Area 3 – Maintenance Complex

- SFRS (Existing construction) – proposed Work does not modify the existing SFRS and does not require Special Inspection
- SFRS (New boat canopy) – proposed canopy system will be designed and fabricated by others, and is assumed to be a combination of cantilevered columns and inverted pendulum. Shop inspections can be waived for approved fabricators. Field inspections are required of the anchor rods, foundation concrete and reinforcing and pile installation.
- Designated Systems: Not applicable for SDC B per IBC 1705.13.4

Wind Requirements, IBC 2024 Section 1704.3

Description of wind-force-resisting system and designated wind systems subject to special inspections:

Area 1 – Education Center

- Wind-force resisting system (Existing construction) – proposed Work does not modify the existing MWFRS and does not require Special Inspection
- Wind-resisting components: Where new exterior wall or roof components are installed, including roofing, sheathing, doors, windows, and/or shutters, etc, periodic special inspections are required of connections of such elements to structure.

Area 2 – Admin Building – Former VC

- Wind-force resisting system (Existing construction) – proposed Work does not modify the existing MWFRS and does not require Special Inspection
- Wind-resisting components: Where new exterior wall or roof components are installed, including roofing, sheathing, doors, windows, and/or shutters, etc, periodic special inspections are required of connections of such elements to structure.

Area 2 – Law Enforcement

- Wind-force resisting system (Existing construction) – proposed Work does not modify the existing MWFRS and does not require Special Inspection
- Wind-resisting components: Where new exterior wall or roof components are installed, including roofing, sheathing, doors, windows, and/or shutters, etc, periodic special inspections are required of connections of such elements to structure.

Area 3 – Maintenance Complex

- Wind-force resisting system (Existing Construction) – Removal of existing hoist beam and bracing requires installation of new beam uplift bracing angle. New angles and their connections require inspection. Other proposed Work does not modify the existing MWFRS and does not require Special Inspection
- Wind-force resisting system (New Boat Canopy) – proposed canopy system will be designed and fabricated by others, and is assumed to be a combination of cantilevered columns and inverted pendulum. No special inspections for wind resistance are required beyond the scheduled inspections per IBC 1705.12. Field inspections are required of the anchor rods, foundation concrete and reinforcing and pile installation.
- Wind-resisting components: Period special inspection is required for roof covering, roof deck, and roof framing connections.

Instructions:

1. Under Listing of Required Structural Tests and Special Inspections:
    a. **Required?** - Place an **X** for all Special Inspections and Tests required for this project.
    b. **Required Qualifications** - Provide qualifications for the special inspector, using the Qualification Requirements for Inspector and Testing Technicians list below, for all required Structural Tests and Special Inspections.
    c. **Continuous** - If marked with an **X**, continuous special inspection shall be as defined in Chapter 2, IBC 2024.
    d. **Periodic** - If marked with an **X**, provide the minimum number of tests, i.e. 20% of all field welds, or the amount of work to be inspected (e.g. 10% of all wall surfaces).
2. Attach completed Statement of Structural Tests and Special Inspections to the end of NPS DSC Division 1 Specifications **Section 01 40 00 Quality Requirements**.

Qualification Requirements for Inspectors and Testing Technicians

PE/SE	Structural Engineer – licensed PE or SE specializing in the design of buildings and structures
PE/GE	Geotechnical Engineer – licensed PE specializing in soil mechanics and foundations
EIT	Engineer-In-Training – graduate engineer who has passed the Fundamentals of engineering examination

American Concrete Institute (ACI) Certification

ACI-CCSI	Concrete Construction Special Inspector
ACI-LTT	Concrete Laboratory Testing Technician Level 1 or 2
ACI-STT	Concrete Strength Testing Technician
ACI-FTT	Concrete Field Testing Technician – Grade I

American Society of Non-Destructive Testing (ASNT) Certification

Non-Destructive Testing Technician – Level II or III

American Welding Society (AWS) Certification

AWS-CWI	Certified Welding Inspector

Exterior Design Institute (EDI) Certification

EDI-EIFS	Certified EIFS inspector

International Code Council (ICC) Certification

ICC-PCSI	Prestressed Concrete Special Inspector
ICC-RCSI	Reinforced Concrete Special Inspector
ICC-SSI	Soils Special Inspector
ICC-SFSI	Spray-applied Fireproofing Special Inspector
ICC-SMSI	Structural Masonry Special Inspector
ICC-SSBSI	Structural Steel and Bolting Special Inspector
ICC-SWSI	Structural Welding Special Inspector

National Institute for Certification in Engineering Technologies (NICET) Certification

NICET-CT	Concrete Technician – Levels I, II, III and IV
NICET-GET	Geotechnical Engineering Technician - Levels I, II, III and IV
NICET-ST	Soils Technician - Levels I, II, III and IV

Other

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

_____ _____

Listing of Required Structural Tests and Special Inspections

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Structural Steel (IBC 2024 Section 1705.2; American Institute of Steel Construction: AISC 360-22 Chapter N, AISC 341-22 Chapter J)				
	Prior to Welding (AISC 360-22 Table C-N5.4-1)				
X	1. Welder qualification records and continuity records.	AWS-CWI or ICC-SWSI	X		
X	2. Welding procedure specifications (WPS) available.	AWS-CWI or ICC-SWSI	X		
X	3. Manufacturer certifications for welding consumables available.	AWS-CWI or ICC-SWSI	X		
X	4. Material identification (type/grade).	AWS-CWI or ICC-SWSI		X	
X	5. Welder identification system.	AWS-CWI or ICC-SWSI		X	
	6. Fit-up of groove welds (including joint geometry).				
	a. Joint preparation.				
	b. Dimensions (alignment, root opening, root face, bevel).				
	c. Cleanliness (condition of steel surfaces).				
	d. Tacking (tack weld quality and location).				
	e. Backing type and fit (if applicable).				
	7. Fit-up of CJP (complete joint penetration) groove welds of HSS (hollow structural sections) T-, Y- and K-joints without backing (including joint geometry).				
	a. Joint preparation.				
	b. Dimensions (alignment, root opening, root face, bevel).				
	c. Cleanliness (condition of steel surfaces).				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	d. Tacking (tack weld quality and location).				
	8. Configuration and finish of access holes.				
	9. Fit-up of fillet welds.				
X	a. Dimensions (alignment, gaps at root).	AWS-CWI or ICC-SWSI		X	25% of welded joints selected at random
X	b. Cleanliness (condition of steel surfaces).	AWS-CWI or ICC-SWSI		X	25% of welded joints selected at random
X	c. Tacking (tack weld quality and location).	AWS-CWI or ICC-SWSI		X	25% of welded joints selected at random
X	10. Check welding equipment.	AWS-CWI or ICC-SWSI		X	
	During Welding (AISC 360-22 Table C-N5.4-2)				
	1. Control and handling of welding consumables				
X	a. Packaging.	AWS-CWI or ICC-SWSI		X	
X	b. Exposure control.	AWS-CWI or ICC-SWSI		X	
X	2. No welding over cracked tack welds.	AWS-CWI or ICC-SWSI		X	25% of welded joints selected at random
	3. Environmental conditions.				
X	a. Wind speed within limits.	AWS-CWI or ICC-SWSI		X	
X	b. Precipitation and temperature.	AWS-CWI or ICC-SWSI		X	
	4. WPS followed.				
X	a. Settings on welding equipment.	AWS-CWI or ICC-SWSI		X	

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
X	b. Travel speed.	AWS-CWI or ICC-SWSI		X	
X	c. Selected welding materials.	AWS-CWI or ICC-SWSI		X	
X	d. Shielding gas type/flow rate.	AWS-CWI or ICC-SWSI		X	
	e. Preheat applied.				
	f. Interpass temperature maintained (minimum/maximum).				
X	g. Proper position (F, V, H, OH).	AWS-CWI or ICC-SWSI		X	
	h. Intermix of filler metals avoided unless approved (AISC 341-22 Section J7).				
X	5. Use of qualified welders.	AWS-CWI or ICC-SWSI	X		
	6. Welding techniques.				
	a. Interpass and final cleaning.				
	b. Each pass within profile limitations.				
	c. Each pass meets quality requirements.				
	7. Placement and installation of headed stud anchors.				
	After Welding (AISC 360-22 Table C-N5.4-3)				
X	1. Welds cleaned.	AWS-CWI or ICC-SWSI		X	25% of welded joints selected at random
X	2. Size, length and location of welds.	AWS-CWI or ICC-SWSI	X		
	3. Welds meet visual acceptance criteria.				
X	a. Crack prohibition.	AWS-CWI or ICC-SWSI	X		
X	b. Weld/base-metal fusion.	AWS-CWI or ICC-SWSI	X		

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
X	c. Crater cross section.	AWS-CWI or ICC-SWSI	X		
X	d. Weld profiles.	AWS-CWI or ICC-SWSI	X		
X	e. Weld size.	AWS-CWI or ICC-SWSI	X		
X	f. Undercut.	AWS-CWI or ICC-SWSI	X		
X	g. Porosity.	AWS-CWI or ICC-SWSI	X		
X	4. Arc strikes.	AWS-CWI or ICC-SWSI	X		
X	5. k-area.	AWS-CWI or ICC-SWSI	X		
	6. Weld access holes in rolled heavy shapes and built-up heavy shapes.				
	7. Backing removed and weld tabs removed (if required).				
X	8. Repair activities.	AWS-CWI or ICC-SWSI	X		
X	9. Document acceptance or rejection of welded joint or member.	AWS-CWI or ICC-SWSI	X		
	10. No prohibited welds have been added without the approval of the EOR (Engineer of Record).				
	11. Placement of reinforcing or contouring fillet welds (if required) (AISC 341-22 Table J7.1).				
	Nondestructive Testing (AISC 360-22 Section N5 and AISC 341-22 Section J7)				
	1. Risk Category II Structures - Perform Ultrasonic Testing on 10% of CJP groove welds in butt, T- and corner joints subject to transversely applied tension loading, in materials 5/16 inch thick or greater.				
	2. Risk Category III or IV Structures - Perform Ultrasonic Testing on all CJP groove welds subject to transversely applied tension loading in butt, T- and corner joints, in materials 5/16 inch thick or greater.				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	3. Access Holes - Perform Magnetic Particle Testing or Liquid Penetrant Testing when the flange thickness exceeds 1.5 inches for rolled shapes, or when the web thickness exceeds 1.5 inches for built-up shapes.				
	4. Welded Joints Subject to Fatigue - Perform testing per AISC 360-22 Section N5c.				
	Nondestructive Testing (AISC 341-22 Section J7)				
	Column Splice and Column to Base Plate PJP Groove Weld (AISC 341-22 Section J7 2b)				
	1. Perform Ultrasonic Testing on 100% of PJP (partial-joint-penetration) groove welds in column splices and column to base plate welds.				
	2. CJP Groove weld.				
	3. Lamellar tearing.				
	4. Beam cope and access hole.				
	5. Reduced beam section repair.				
	6. Weld tab removal.				
	Prior to Bolting (AISC 360-22 Table C-N5.6-1)				
	These inspections are not required for snug-tight joints.				
X	1. Manufacturer's certifications available for fastener materials.	ICC-SSBSI, EIT, or PE/SE	X		
X	2. Fasteners marked in accordance with ASTM requirements.	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random
X	3. Correct fasteners selected for the joint detail (grade, type, bolt length if threads are to be excluded from shear plane).	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random
X	4. Correct bolting procedure selected for joint detail.	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
X	5. Connecting elements, including the appropriate faying surface condition and hole preparation, if specified, meet applicable requirements.	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random
X	6. Pre-installation verification testing by installation personnel observed and documented for fastener assemblies and methods used.	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random
X	7. Protected storage provided for bolts, nuts, washers and other fastener components.	ICC-SSBSI, EIT, or PE/SE		X	25% of bolted joints selected at random
	During Bolting (AISC 360-22 Table C-N5.6-2)				
	These inspections are not required for snug-tight joints.				
	These inspections are not required for pretensioned joints and slip-critical joints, when the installer is using the turn-of-nut method with matchmarking techniques, the direct-tension-indicator method, or the twist-off-type tension control bolt method.				
	1. Fastener assemblies, of suitable condition, placed in all holes and washers (if required) are positioned as required.				
	2. Joint brought to the snug-tight condition prior to the pretensioning operation.				
	3. Fastener component not turned by the wrench prevented from rotating.				
	4. Fasteners are pretensioned in accordance with the RCSC (Resource Council on Structural Connections) Specification, progressing systematically from the most rigid point toward the free edges.				
	After Bolting (AISC 360-22 Table C-N5.6-3)				
X	Document acceptance or rejection of bolted connections.	ICC-SSBSI, EIT, or PE/SE	X		
	Galvanized Structural Steel Main Members (AISC 360-22 Table C-N5.6-3)				
X	Inspect per AISC 360-22 Section N5.7.	ICC-SSBSI, EIT, or PE/SE		X	

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Other Inspection Tasks (AISC 360-22 Section N5.8 and AISC 341-22 Section J9)				
X	1. Verify compliance of fabricated steel with the details shown on the approved shop drawings.	ICC-SSBSI, EIT, or PE/SE		X	
X	2. Verify compliance of the erected steel frame with the details shown on the approved erection drawings, including braces, stiffeners, member locations and joint details.	ICC-SSBSI, EIT, or PE/SE		X	
	3. Anchor rods and other embedments support structural steel.				
X	a. Verify the diameter, grade, type and length of the anchor rod or embedded item.	ICC-SSBSI, EIT, or PE/SE		X	
X	b. Verify the extent or depth of embedment into the concrete.	ICC-SSBSI, EIT, or PE/SE		X	
	4. RBS (reduce beam section) requirements, if applicable. (AISC 341-22)				
	a. Contour and finish.				
	b. Dimensional tolerances.				
	5. Protected zone - no holes or unapproved attachments made by fabricator or erector, as applicable. (AISC 341-22)				
	Inspection of H-Piles (AISC 341-22 Section J11)				
	1. Protected zone - no holes or unapproved attachments made by the responsible contractor, as applicable. (AISC 341-22 Table J11.1)				
	Structural Stainless Steel (IBC 2024 1705.2.2)				
	1. Special inspections and nondestructive testing in accordance with AISC 370-21.				
	Cold-formed Steel Deck (IBC 2024 1705.2.3)				
	2. Special inspections in accordance with QA/QC-2022 Standard for Quality control (QC) and Quality assurance (QA) for Installation of Steel Deck.				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Open-Web Steel Joists and Joist Girders (IBC 2024 Table 1705.2.4)				
	1. Installation of open-web steel joists and joist girders.				
	a. End connections - welding or bolted.				
	b. Bridging - horizontal or diagonal.				
	1. Standard bridging.				
	2. Bridging that differs from the SJI (Steel Joist Institute) specifications listed in Section 2207.1.				
	Inspection of Composite Structures Prior to Concrete Placement (AISC 341Table J10.1)				
	1. Material identification of reinforcing steel (Type/Grade).				
	2. Determination of carbon equivalent for reinforcing steel other than ASTM A706.				
	3. Proper reinforcing steel size, spacing and orientation.				
	4. Reinforcing steel has not been rebent in the field.				
	5. Reinforcing steel has been tied and supported as required.				
	6. Required reinforcing steel clearances have been provided.				
	7. Composite member has required size.				
	Inspection of Composite Structures During Concrete Placement (AISC 341-22 Table J10.2)				
	1. Concrete: Material identification (mix design, compressive strength, maximum large aggregate size, maximum slump).				
	2. Limits on water added at the truck or pump.				
	3. Proper placement techniques to limit segregation.				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Inspection of Composite Structures After Concrete Placement (AISC 341-22 Table J10)				
	1. Achievement of minimum specified concrete compressive.				
	Cold-formed Steel Trusses Spanning 60-feet or Greater (IBC 2024 Section 1705.2.45)				
	1. Verify temporary installation restraint/bracing installed in accordance with the approved shop drawings.				
	2. Verify permanent individual truss member restraint/bracing installed in accordance with the approved shop drawings.				
	Metal Building Systems (IBC 2024 Section 1705.2.6 - Inspect per Structural Steel requirements above as applicable plus requirements in IBC 2024 Table 1705.2.6)				**Note: Inspections are applicable to prefabricated boat canopy, unless more specific criteria is specified by canopy specialty Structural Engineer.**
X	1. Installation of rafter/beam flange braces and column flange braces.	ICC-SSBSI, EIT, or PE/SE		X	
X	2. Installation of purlins and girts, including specified lapping.	ICC-SSBSI, EIT, or PE/SE		X	
X	3. Purlin and girt restraint/bridging/bracing.	ICC-SSBSI, EIT, or PE/SE		X	
	4. Installation of X-bracing, tightened to remove any sag.			X	
	Concrete Construction (IBC 2024 Section 1705.3)				
X	1. Inspect reinforcing steel, including prestressing tendons, and verify placement.	ACI-CCSI, ICC-RCSI, EIT, or PE/SE		X	Each pile cap prior to concrete placement
	2. Inspection of reinforcing steel welding				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	a. Verify weldability of reinforcing bars other than ASTM A706.				
	b. Inspect welding of reinforcement for special moment frames, boundary elements of special structural walls and coupling beams.				
	c. Inspect welded reinforcement splices.				
	d. Inspect welding of primary tension reinforcement in corbels.				
	e. Inspect single pass fillet welds, maximum 5/16 inch.				
	f. Inspect all other weds.				
X	3. Inspection of anchors cast in concrete.	ACI-CCSI, ICC-RCSI, EIT, or PE/SE		X	Each pile cap prior to concrete placement
X	4. Inspection of anchors post-installed in hardened concrete members.				
	a. Adhesive anchors installed in horizontally or upwardly inclined orientations to resist sustained tension load.	ACI-CCSI, EIT, or PE/SE	X		Each canopy anchor if anchors are not cast in place (anchorage design by canopy Specialty Structural Engineer)
	b. Mechanical anchors and adhesive anchors not defined in 4a.	ACI-CCSI, EIT, or PE/SE		X	Each canopy anchor if anchors are not cast in place (anchorage design by canopy Specialty Structural Engineer)
X	5. Verify use of approved design mix.	ACI-CCSI, ICC-RCSI, NICE-CT, EIT, or PE/SE		X	Each concrete placement

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
X	6. Prior to placement fabricate specimens for strength tests, perform slump and air content tests, and determine the temperature of the concrete.	ACI-CCSI, ACI-FTT, ICC-RCSI, or NICE-CT	X		
X	7. Inspect concrete and shotcrete placement for proper application techniques.	ACI-CCSI, ICC-RCSI, or NICE-CT	X		
X	8. Inspect for maintenance of specified curing temperature and techniques.	ACI-CCSI, ICC-RCSI, or NICE-CT		X	Each concrete placement
	9. Inspection of prestressed concrete:				
	a. Application of prestressing forces.				
	b. Grouting of bonded prestressing tendons in the seismic-force-resisting system.				
	10. Erection of precast structural members.				
	11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E, or F, inspect such connections and reinforcement in the field for:				
	a. Installation of the embedded parts.				
	b. Completion of the continuity of reinforcement across joints.				
	c. Completion of connections in the field.				
	12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5 (American Concrete Institute).				
	13. Verification of in-situ concrete strength, prior to stressing of tendons in post-tensioned concrete and prior to removal of shores and forms from beams and structural slabs.				
X	14. Inspection formwork for shape, location and dimensions of the concrete member being formed.	ACI-CCSI, ICC-RCSI, or NICE-CT		X	Each pile cap and canopy support pedestal
	Masonry Construction (IBC 2024 Section 1705.4)				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	1. Inspect masonry construction in accordance with IBC 2024 Section 1705.4 and TMS 402-22 and TMS 602-22 (The Masonry Society).				
	Level 1 Quality Assurance				
	Verification Requirements:				
	1. Prior to construction, verification of compliance of submittals.				
	Level 2 Quality Assurance				
	Verification Requirements:				
	1. Prior to construction, verification of comliance submittals.				
	2. Prior to construction, verification of f'_m and f'_{AAC} except where specifically exempted by the code.				
	3. During construction, verification of slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site in accordance with TMS 602-22 Specification Article 1.5 & 1.6.3.				
	Inspection Tasks:				
	1. As masonry construction begins, verify the following are in compliance:				
	a. Proportions of site-prepared mortar.				
	b. Grade and size of prestressing tendons and anchorages.				
	c. Grade, type and size or reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages.				
	d. Prestressing technique.				
	e. Properties of thin-bed mortar for AAC (autoclaved aerated concrete) masonry.				
	f. Sample panel construction.				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	2. Prior to grouting, verify the following are in compliance:				
	a. Grout space.				
	b. Placement of prestressing tendons and anchorages.				
	c. Placement of reinforcement, connectors, and anchor bolts.				
	d. Proportions of site-prepared grout and prestressing grout for bonded tendons.				
	3. Verify the compliance of the following during construction:				
	a. Materials and procedures with the approved submittals.				
	b. Placement of masonry units and mortar joint construction.				
	c. Size and location of structural members.				
	d. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.				
	e. Welding of reinforcement.				
	f. Preparation, construction and protection of masonry during cold weather (temperature below 40 degrees Fahrenheit) or hot weather (temperature above 90 degrees Fahrenheit).				
	g. Application and measurement of prestressing force.				
	h. Placement of grout and prestressing grout for bonded tendons is in compliance.				
	i. Placement of AAC masonry units and construction of thin-bed mortar joints.				
	4. Observe preparation of grout specimens, mortar specimens and/or prisms.				
	Level 3 Quality Assurance				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Verification Requirements:				
	1. Prior to construction, verification of compliance of submittals.				
	2. Prior to construction, verification of f'_m and f'_{AAC} except where specifically exempted by the Code.				
	3. During construction, verification of Slump flow and Visual Stability Index (VSI) when self-consolidating grout is delivered to the project site in accordance with TMS 602-22 Specification Article 1.5 & 1.6.3.				
	4. During construction, verification of f'_m and f'_{AAC} for every 5000 square feet.				
	5. During construction, verification of proportions of materials as delivered to the project site for premixed or preblended mortar, prestressing grout, and grout other than self-consolidating grout.				
	Inspection Tasks:				
	1. As masonry construction begins, verify the following are in compliance:				
	a. Proportions of site-prepared mortar.				
	b. Grade and size of reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages.				
	c. Grade, type and size or reinforcement, connectors, anchor bolts, and prestressing tendons and anchorages.				
	d. Prestressing technique.				
	e. Properties of thin-bed mortar for AAC (autoclaved aerated concrete) masonry.				
	f. Sample panel construction.				
	2. Prior to grouting, verify the following are in compliance:				
	a. Grout space				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	b. Placement of prestressing tendons and anchorages.				
	c. Placement of reinforcement, connectors, and anchor bolts.				
	d. Proportions of site-prepared grout and prestressing grout for bonded tendons.				
	3. Verify compliance of the following during construction:				
	a. Materials and procedures with the approved submittals.				
	b. Placement of masonry units and mortar joint construction.				
	c. Size and location of structural members.				
	d. Type, size and location of anchors, including other details of anchorage of masonry to structural members, frames, or other construction.				
	e. Welding of reinforcement.				
	f. Preparation, construction and protection of masonry during cold weather (temperature below 40 degrees Fahrenheit) or hot weather (temperature above 90 degrees Fahrenheit).				
	g. Application and measurement of prestressing force.				
	h. Placement of grout and prestressing grout for bonded tendons is in compliance.				
	i. Placement of AAC masonry units and construction of thin-bed mortar joints.				
	4. Observe preparation of grout specimens, mortar specimens and/or prisms.				
	Wood Construction (IBC 2024 Section 1705.5)				
	1. Inspect prefabricated wood structural elements in accordance with Section 1704.2.5.				
	2. High load diaphragms:				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	a. Verify sheathing grade and thickness.				
	b. Verify nominal size of framing members at adjoining panel edges.				
	c. Verify nail or staple diameter and length.				
	d. Verify number of fastener lines.				
	e. Verify spacing between fasteners in each line and at panel edges.				
	3. Shearwalls:				
	a. Verify sheathing grade and thickness.				
	b. Verify nominal size of framing members at adjoining panel edges.				
	c. Verify nail or staple diameter and length.				
	d. Verify number of fastener lines.				
	e. Verify spacing between fasteners in each line and at panel edges.				
	f. Location and size of holdowns.				
	4. Verify nailing, bolting, anchoring and fastening of:				
	a. Drag struts and collectors.				
	b. Braces.				
	c. Hold-downs.				
	5. Metal-plate-connected wood trusses spanning 60 feet or greater:				
	a. Verify temporary installation restraint/bracing installed in accordance with the approved shop drawings.				
	b. Verify permanent individual truss member restraint/bracing installed in accordance with the approved shop drawings.				
	Mass Timber Construction				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	(IBC 2024 Section 1705.5.3) Mass timber elements in Types IV-A, IV-B and IV-C:				
	1. Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.				
	2. Inspect erection of mass timber construction.				
	3. Inspection of connections where installation methods are required to meet design loads.				
	4. Threaded fasteners:				
	a. Verify use of proper installation equipment.				
	b. Verify use of pre-drilled holes where required.				
	c. Inspect screws, including diameter, length, head type, spacing, installation angle and depth.				
	5. Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.				
	6. Adhesive anchors not defined in preceding cell.				
	7. Bolted connections.				
	8. Concealed connections.				
	Soils (IBC 2024 Section 1705.6)				
	1. Verify materials below shallow foundations are adequate to achieve the required bearing capacity.				
	2. Verify excavations are extended to proper depth and have reached proper material.				
	3. Perform classification and testing of compacted fill materials.				
	4. During fill placement, verify use of proper materials and procedure in accordance with the provisions of the approved geotechnical report.				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Verify densities and lift thicknesses during placement and compaction of compacted fill.				
	5. Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.				
	Driven Deep Foundation Elements (IBC 2024 Section 1705.7)				
X	1. Verify element materials, sizes and lengths comply with the requirements.	EIT or PE/GE	X		
	2. Determine capacities of test elements and conduct additional load tests when required. Refer to project specifications.				
X	3. Inspect driving operations and maintain complete and accurate records for each element.	EIT or PE/GE	X		
	4. Verify element locations and plumbness.		X		
X	a. Verify type and size of hammer.	EIT or PE/GE	X		
X	b. Record number of blows per foot of penetration.	EIT or PE/GE	X		
X	c. Determine required penetration to achieve specified capacity.	EIT or PE/GE	X		
X	d. Record pile tip and butt elevations.	EIT or PE/GE	X		
X	e. Document any damage to any foundation element.	EIT or PE/GE	X		
	5. For steel piling, perform additional inspection in accordance with Section 1705.2 and AISC 341-16, Table J10.1.				
	6. For concrete elements and concrete-filled elements, perform additional inspections in accordance with Section 1705.3.				
	7. For specialty elements, perform additional inspections as determined by the registered design professional in responsible charge as required in the project specifications.				
	Cast-in-Place Deep Foundation (IBC 2024 Section 1705.8)				

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	1. Inspect drilling operations and maintain complete and accurate records for each element.				
	2. Verify element locations and plumbness.				
	a. Verify element diameter.				
	b. Verify bell diameter (if applicable).				
	c. Verify element lengths.				
	d. Verify embedment depth into bedrock (if applicable).				
	e. Verify adequate end-bearing strata capacity.				
	f. Record concrete or grout volumes.				
	3. For concrete elements, perform tests and additional inspections in accordance with Section 1705.3.				
	Helical Piles (IBC 2024 Section 1705.10)				
	1. Verify pile locations.				
	a. Verify installation equipment used.				
	b. Verify pile dimensions.				
	c. Verify tip elevations.				
	d. Verify final depth.				
	e. Verify final installation torque.				
	f. Other data as required by the project specifications.				
	Fabricated Items (IBC 2024 Section 1705.11)				
X	1. Inspect fabricated items in accordance with Section 1704.2.5.	As required for scope of work	X		Perform inspections of shop fabricated boat canopy

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
					assembly, if applicable. Shop inspections may be waived with Contracting Officer approval where IBC 1704.2.5.1 applies.
	Wind Resistance (IBC 2024 Section 1705.12)				
X	1. Provide inspections when required by Section 1705.12.	EIT or PE/SE		X	25% of connections of all wind resisting elements on each exterior wall.
	Seismic Resistance (IBC 2024 Section 1705.13)				
	1. Provide inspections when required by Section 1705.13.				
	Testing and Qualification for Seismic Resistance (IBC 2024 Section 1705.14)				
	1. Test and qualify seismic resistance in accordance with IBC 2024 Section 1705.14 and the project specifications.				
	Sprayed Fire-Resistive Materials (IBC 2024 Section 1705.15)				
	1. Inspect sprayed fire-resistant materials in accordance with IBC 2024 Section 1705.15 and the project specifications.				
	Intumescent Fire-Resistive Materials (IBC 2024 Section 1705.16)				
	1. Perform inspections in accordance with AWCI 12-B (Association of the Wall and Ceiling Industry) and IBC 2024 Section 1705.16.			X	

Required?	Structural Test or Special Inspection	Required Qualifications	Continuous	Periodic	Frequency of Periodic Test or Inspection
	Exterior Insulation and Finish Systems (EIFS) (IBC 2024 Section 1705.17)				
	1. Perform inspections in accordance with project specifications and IBC 2024 Section 1705.17.			X	
	Fire-Resistant Penetrations and Joints (IBC 2024 Section 1705.18)				
	1. Perform inspections in accordance with project specifications and IBC 2024 Section 1705.18.			X	
	Smoke Control (IBC 2024 Section 1705.19)				
	1. Perform testing in accordance with project specifications and IBC 2024 Section 1705.19.				
	Sealing of Mass Timber (IBC 2024 Section 1705.20)				
	1. Perform testing in accordance with project specifications and IBC 2024 Section 1705.20.				