

**NATIONAL PARK SERVICE
KENAI FJORDS NATIONAL PARK & PRESERVE**

KEFJ 184638
**SEWARD VISITOR CENTER
REHABILITATION**



**Construction Documents
September 28, 2016**

SECTION 00 01 10

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SECTION 01 11 00 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Work covered by the Contract Documents.
2. Work phases.
3. Work under other contracts.
4. Government Furnished Materials.
5. Contractor use of premises.
6. Public use of site.
7. Occupancy requirements for buildings.
8. Work Restrictions.
9. Special Construction Requirements.
10. Additional Reports.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Location: Visitor Center, Kenai Fjords National Park, Seward, Alaska.

B. The Work consists of the following:

1. The Work includes the general rehabilitation of the Visitor Center including architectural, structural, mechanical, fire protection and electrical work.

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

1.3 WORK COMPLETION DATES

A. The Work shall be completed as follows:

1. Interior Work including, but not limited to, architectural, structural, mechanical, fire protection and electrical work. Work of this phase shall be substantially complete and ready for occupancy by April 13, 2018.
2. The remaining Work shall be substantially complete and ready for occupancy at the Contract Completion Date.

1.4 CONTRACTOR USE OF SITE

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

1. Exterior: Contractor will have access for exterior work on September 5, 2017. Confine constructions operations to work that does not interfere with occupancy and use of the building.
 2. Interior: Contractor will not have access to the interior until October 2, 2017.
- B. Storage of Materials: Material may be stored with the project limits as shown on the drawings.
- C. Preservation of Site Features:
1. Prevent damage to site features. Restore damaged areas, repairing or replacing damaged areas, at no additional expense to the Government.
 2. Provide temporary barriers to protect site features.
 3. Do not remove site features without prior approval. Consult with Contracting Officer and remove agreed-on site features that interfere with construction.
 4. Carefully supervise excavating, grading, filling, and other construction operations near site features to prevent damage.
- D. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Government, Government's employees, and emergency vehicles at all times while the building is occupied. Do not use these areas 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.
- E. Construction Camp: Establishment of a camp within the park or on the Project site will not be permitted.
- F. Hauling Restrictions: Comply with all legal load restrictions in the hauling of materials. Load restrictions on park roads are identical to the state load restrictions with such additional regulations as may be imposed by the Park Superintendent. Information regarding rules and regulations for vehicular traffic on park roads may be obtained from the Office of the Park Superintendent. A special permit will not relieve Contractor of liability for damage which may result from moving of equipment.

1.5 PUBLIC USE OF SITE

- A. Contractor shall at all times conduct his operations to ensure the least inconvenience to the public. The building and site will be closed to the public between September 5, 2017 and May 25, 2018.

1.6 OCCUPANCY REQUIRMENTS FOR BUILDIDINGS

- A. Existing Buildings
1. Full Government Occupancy: Government will occupy buildings that will be under construction until October 2, 2017. Cooperate with Government during exterior construction operations to minimize conflicts and facilitate Government usage. Perform the Work so as not to interfere with Government's day-to-day 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 the CO.
 - b. Maintain existing building in a weather tight condition throughout construction period. Repair damage caused by construction operations. Protect building and its occupants during construction period.
- 2. Government Occupancy of Completed Areas of Construction: Government reserves the right to occupy and to place and install equipment in completed areas of building, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the entire project.
 - a. Contracting Officer will prepare a Beneficial Occupancy letter for each specific portion of the Work to be occupied before Government occupancy.
 - b. Obtain a Certificate of Occupancy from the NPS before Government occupancy.
 - c. Before partial Government occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Government will operate and maintain mechanical and electrical systems serving occupied portions of building.
 - d. On occupancy, Government will assume responsibility for maintenance and custodial service for occupied portions of building.

1.7 CONDUCT OF OPERATIONS

- A. At all times the contractor shall conduct his operations in conformance with the rules and regulations promulgated by the Secretary of the Interior for the National Park Service, and applicable park rules and regulations prescribed by the Park Superintendent.
- B. Work on Sundays, Federal holidays or at night may not be performed without prior consent from the Contracting Officer. Submit requests 48 hours in advance of the work to the Contracting Officer for approval.
- C. No signs or advertisements (except those specified herein) shall be displayed on the construction site or within the park unless approved by the Contracting Officer.

1.8 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7 a.m. to 7 p.m., Monday through Saturday, except when otherwise indicated.
- 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 days in advance of proposed utility interruptions.
 2. Do not proceed with utility interruptions without Contracting Officer's written permission.
 3. Hours for Utility Shutdowns: Utilities may not be shut down for more than 2 hours in a 24 hour period.
- D. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 11 00

SECTION 01 26 01 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. The work of this section consists of administrative and procedural requirements for contract modifications.

1.2 DEFINITIONS AND ALLOWANCES

- A. Home Office Overhead: Those 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 the preparation of modifications will not be allowed. The 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, 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: These are 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 the 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: This is the hourly rate paid directly to the worker
- b. Labor Burden: Employer payments of all applicable burdens, this includes insurance and taxes that 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) FUTA– Cap Rate and percentage to be proportionally allocated over one year.
- 5) 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 the contractor from claims resulting from bodily injury or property damage to a third party. Include this as a separate line item within all modification proposals and provide a current insurance quote upon request.
- G. Performance and Payment Bonds: A performance bond is a surety bond issued by an insurance company or bank to guarantee satisfactory completion of a project. The Payment Bond guarantees that the contractor will pay the labor and material costs they have incurred. Banks and Insurance companies charge a premium for each individual project based on a sliding scale which relates to the size of the project. Include this as a separate line item in modification proposals and provide current company bonding rates upon request.
- H. Builder's Risk Insurance: This covers the contractor's loss due to fire, high winds, or other natural forces. This is 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. Your proposal must be received in the format and within the time frame specified in the Request for Proposal letter. Costs or delays resulting from failure of contractor to submit within the time frame specified will not be compensable.
- 2. The proposal must 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 that 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 Gov't provided form.

3. Requests for extensions of contract time as a result of this change must be justified with a Time Impact Analysis (TIA). Refer to Division 01 Specification, "Construction Schedule", for time impact analysis requirements. TIA and associated costs must 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 the 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 upon request.
5. Contractor must review and approve all subcontractor/supplier pricing in detail for proper format, scope, production rates, and pricing prior to submission to the 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 the cost of labor by itemizing each craft involved, indicating worker hourly rate (base rate + labor burden + fringe benefits) for each and itemizing the hours required for each craft that will be directly engaged in modification work. Any work proposed that will require overtime work or premium pay shall be itemized separately. All rates shall be in accordance with the Davis-Bacon Act as incorporated herein. Labor Burden may include payroll taxes, Social Security, unemployment insurances, workers compensation insurance, 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. The labor cost for foremen shall only be costs for related work required for the modification.

C. Materials:

1. The estimated cost for materials shall include quotes from multiple sources. Material prices must include all 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 the NPS.

D. Equipment:

1. Equipment used for the project must be appropriately sized for the 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 must be broken out separately.
3. Regardless of ownership, the rates to be used in determining equipment rental costs shall be the lowest cost from one of the following sources:
 - a. 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. The estimated equipment rates shall include the operating costs of all fuel, oil, lubrication, supplies, small tools, necessary attachments, ground engaging components, tires & tracks, routine repairs and maintenance (cost of major repair and overhaul is not allowed per 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 the full rate for equipment only for the duration that the equipment will be utilized to accomplish the work of the modification.
 6. Standby unit rates used are to be in accordance with paragraph 1.3, D, 2, above. If the US Army Corp of Engineers is utilized then their standby rates prevail. If Bluebook or local equipment pricing is accepted, then ½ of the 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, the established standby rate shall apply from the first day of the delay.
 8. Equipment that is not used and on the jobsite for up to five consecutive days may be classified at standby rates, provided that the equipment is or has been used solely to perform work on the modification and will be necessary to complete additional modification work. Equipment that is 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 31 which have been applied to the specific type of work included in this project. Negotiated rates shall not exceed the following percentages for OH&P for contractor self-performed work:
 - Overhead.....10%
 - Profit.....5%
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, than the partnership may only receive home office overhead and profit in the same amount as an individual contractor (refer to par 1.3,E,1 above). It is the responsibility of the partners to decide on the division of revenue.
4. Combined Increases and Decreases: On proposals involving both increases and decreases in the Contract Price, the overhead and profit mark-ups are required on the 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

PART 3 - EXECUTION

END OF SECTION 012601

SECTION 01 27 00 – DEFINITION OF CONTRACT LINE ITEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. The intent of this section is to explain, in general, what is and what is not included in a contract line item, and the limits or cut-off points where one item ends and another begins.
- B. If no contract line item exists for a portion of the work, include the costs in a related item.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF CONTRACT LINE ITEMS

- A. Contract Line Item No. 0001 Rehabilitate Visitor
 - 1. This item consists of the general rehabilitation of the Visitor Center and construction of an addition to accommodate an elevator.
 - 2. Payment will be made at the contract lump sum price.
- B. Contract Line Item No. 0002 Bid Option A: Replace Existing Windows
 - 1. This item consists of removal and replacement of existing windows.
 - 2. Payment will be made at the contract lump sum price.

END OF SECTION 01 27 00

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This 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 SharePoint Project Website.
 - 7. Project meetings.
 - 8. 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 CONSTRUCTION COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the 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 the 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 adequate 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 all 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, the following:
 - 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.

1.3 SUBMITTALS

- A. Division 01 documents: The following items shall be submitted a minimum of one week prior to the Preconstruction Conference. Contracting Officer will notify Contractor of tentative date for the Pre-Construction Conference.
 - 1. Letter designating Project Superintendent.
 - 2. Construction Schedule.
 - 3. A comprehensive breakdown of the 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. Satisfactory evidence of liability insurance coverage and workman's compensation for the Contractor and all subcontractors.
 - 8. Waste Management Plan.
 - 9. Quality Control Plan.
 - 10. Contractors Commissioning Plan.
 - 11. List of Required Construction Permits. Include the following information for each permit:
 - a. Name of Permit.
 - b. The Agency(ies) with Jurisdiction issuing the permit.
 - c. Information required from the Government to complete the permit application.
- B. All items listed must be provided to the Contracting Officer before the Pre-Construction Conference is held. If all of these documents have not been received one week prior to the scheduled Pre-Construction Conference date, the conference will be cancelled, Notice to

Proceed will not be issued, and the Contracting Officer will consider other contractual remedies. Work shall not commence until written Notice to Proceed has been issued.

1.4 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI utilizing the form created on the NPS/DSC SharePoint Project website.
 - 1. CO 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 the RFI: Include a 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 the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 8. 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 the RFI Form on the NPS/DSC SharePoint website as follows:
 - 1. Enter the general information at the top of the form.
 - 2. Under the "Action" section at the bottom of the form, select "Question" then select "CMR" in the drop-down of the "Send to" box.
 - 3. Enter the details of the question and attach related documents.
 - 4. Select "Submit Form" at the bottom of the page.
- D. Contracting Officer's Action: CO will review each RFI, determine action required, and respond. CO will determine the critical nature of each RFI and issue a 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 the Contract Documents.

- e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
- 2. CO's action may include a request for additional information, in which case time for response will date from time of receipt of additional information.
 - 3. CO's action on RFIs may result in the need for a change to the Contract Time or the Contract Sum. All contract changes will be processed following the terms and conditions of the contract.

1.5 PROJECT WEB SITE

- A. Use the NPS/DSC SharePoint Project website for communication throughout the contract period. The NPS/DSC SharePoint Project website will be used for the following functions:
 - 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. Drawing and specification document hosting, viewing, and updating.
 - 12. Online document collaboration.
 - 13. Reminder and tracking functions.
 - 14. Archiving functions.
 - 15. Notification of submittal and RFI statuses and current responsible party.
 - 16. Permits and addendums
- B. Some documents however are not suitable to be shared using the NPS/DSC SharePoint Project website. Documents containing Personal Identifying Information (PII) (i.e. certified payrolls) shall not be shared using the NPS/DSC SharePoint Project website and shall be coordinated with the SharePoint Project team as appropriate.
- C. Submit to the CO a list of all employees who will need access to the website. The users will receive an invitation to register from the Department of Interior (DOI). Once the user is registered on the DOI website, they will be given access to the NPS/DSC SharePoint Project website. For login procedures and other SharePoint information, refer to the Workflows website at http://www.nps.gov/dscw/precon_spproj.htm.
- D. All users will be required to have the following software packages:
 - 1. Internet Explorer version 7 or later.
 - 2. Adobe Acrobat Professional (Pro) version 9 or later

1.6 PROJECT MEETINGS

- A. Preconstruction Conference: Before start of construction, Contracting Officer will arrange an on-site meeting with Contractor. The 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 01 documents.
5. Coordination of Subcontractors.
6. Labor law application.
7. Modifications.
8. Payments to Contractor.
9. Payroll reports.
10. Contract time.
11. Liquidated damages.
12. Contractor Performance Evaluation.
13. Display of Hotline posters.
14. Notice to proceed.
15. Correspondence procedures.
16. NPS/DSC SharePoint Project website.
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.

- B. Progress Meetings: The Contracting Officer will schedule weekly meetings with the 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 at these meetings. All participants at the meeting shall be familiar with the 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. The meeting agenda will include the following:
 - 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,
 - h. Construction Schedule update (provide updated CPM).
 - i. Status of Project Record Drawings and O&M manuals.
 - j. Other business relating to work.
 - k. Permit requirements.
- C. Preinstallation Conferences: Conduct a preinstallation conference 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 the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise CO of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility requirements.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of agency(ies) with jurisdiction.
 - s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

1.7 PERMITS

A. General:

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

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

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

C. Administrative Procedures:

1. Coordinate scheduling and timing of required administrative provisions of project permits with Agency(ies) with Jurisdiction, Construction Manager, and Park to avoid conflicts and to ensure orderly execution of the Work.
2. Supply all needed information to Agency(ies) with Jurisdiction issuing permits, pay any fees required and provide all material needed to comply with the permit's conditions and provisions.
3. Upload permits to the NPS/DSC SharePoint project website when the 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. This Section consists of Construction Schedule requirements including but not limited to the following:
 - 1. Schedule of Values
 - 2. Construction Schedule Requirements.
 - 3. Construction Schedule Updates.
 - 4. Time Impact Analysis.
- B. Purpose: The purpose of the Construction Schedule is to ensure adequate planning, coordination, scheduling, and reporting during execution of the work by the Contractor. The Construction Schedule will assist the Contractor and Contracting Officer in monitoring the progress of the work, evaluating proposed changes, and processing the Contractor's monthly progress payment.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be 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 must 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: The allocation of the Schedule of Values for the 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. CPM: Critical path method, which is a 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: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Float: The measure of leeway in starting and completing an activity.
 - 1. Float: Float is not for the exclusive use or benefit of either the Government or the Contractor but is jointly owned.
 - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- F. Resource Loading: The allocation of manpower and equipment necessary for the 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: All schedules and reports submitted shall be posted on the NPS DSC SharePoint project website, provided in the native electronic file format. It is the intent of the Government to limit the number of printed reports to only those reports determined by the project team to be essential.
- B. Schedule of Values: After contract award and before the Pre-Construction conference submit a schedule of dollar values based on the Contract Price Schedule.
- C. Construction Baseline Schedule: After contract award and before the Pre-Construction conference, submit two paper copies of baseline schedule, large enough to show entire schedule for entire construction period.
- D. CPM Reports: Concurrent with CPM schedule, submit two paper copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, 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 all 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 all 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 all activities sorted in ascending order of total float.
- E. Construction Schedule Updates: On or before the 7th day preceding the progress payment request date, submit estimates of the 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 a Time Impact Analysis. Each Time Impact Analysis shall include a Fragmentary Network (Fragnet), incorporated into the currently accepted Construction Schedule, demonstrating how the Contractor proposes to incorporate a modification, change, delay, or Contractor request.

1.4 QUALITY ASSURANCE

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

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

- B. Contractor's Schedule Representative: Before or at the preconstruction conference, designate an authorized representative to be responsible for the preparation and maintenance of the Construction Schedule. A resume outlining the qualifications of the Scheduler shall be submitted to the Contracting Officer for acceptance. The Scheduler shall have prepared and maintained at least 5 previous schedules of similar size and complexity similar to this Contract, demonstrating proficiency in the use of scheduling software. The authorized representative will be responsible for preparing the Baseline Schedule, all required updates, revisions, Time Impact Analyses, and preparation of 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 the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
1. In developing the Construction Baseline Schedule, ensure that the Subcontractor's work at all tiers, as well as the prime Contractor's work, is included and coordinated.
 2. Secure time commitments for performing critical elements of the Work from parties involved.
 3. Coordinate each construction activity in the network with other activities and schedule them 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. The work activities broken out within the schedule of values shall be integrated into and made a logical part of the construction baseline schedule submitted under this specification. The total costs for the component work activities shall equal the contract price for that lump-sum item. The 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. The total cost of all items shall equal the contract price. The Schedule of Values will form the basis for progress payments.
- D. An acceptable Schedule of Values shall be agreed upon by the Contractor and Contracting Officer before the first progress payment is processed.

2.2 CONSTRUCTION SCHEDULE REQUIREMENTS

- A. Construction Baseline Schedule: Prepare Construction Baseline Schedule using a computerized, resource-loaded, time-scaled CPM 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 all work within applicable completion dates, regardless of Governments acceptance of the 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 the preliminary CPM network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the 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 CPM schedule within the limitations of the Contract Time.
 - 4. The Construction Baseline Schedule as developed shall show the sequence and interdependence of activities required for complete performance of the work. Ensure all work sequences are logical and the Construction Baseline Schedule shows a coordinated plan of the work.
 - 5. Resource loading of each activity shall include all personnel by labor category and equipment type and capacity proposed to complete the activity in the duration shown.
 - 6. Consider seasonal weather conditions in planning and scheduling all work influenced by high and low ambient temperatures, wind, or precipitation to ensure completion of all work within the contract time.

7. Time Frame: Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity.
 - a. An early finish date may be shown but the late finish date must be the same date as the last day of the contract period. An early completion schedule must contain the following:
 - 1) Insert an activity titled "Project Float" as a successor to the last activity in the 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 the Contract Period.
 - b. Contract completion date shall not be changed by submission of a schedule that shows an early completion date.
 - c. The 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 a calendar that is based on a 7 day week to be used on any activities that are based on calendar days. Apply this calendar to administrative tasks or any other tasks that are not affected by non-working days (Federal Holidays, weather, etc.).
 - 2) Project Calendar: Include a calendar that is based on the planned work week for the project. Include Federal Holidays, weekends, and any other non-work days indicated in the contract documents. Apply this calendar to activities which are not anticipated to be affected by weather.
 - 3) Weather Calendar: Utilize the Project Calendar and show anticipated normal downtime related to weather as non-working time. Weather days shall be based on data for the local area from a reliable source like the National Oceanic and Atmospheric Administration (NOAA), National Park Service records, or source acceptable to the Contracting Officer. Apply this calendar to activities that are anticipated to be affected by weather.
 - e. Activity Duration: Define activities so no activity is longer than 15 days, except for non-construction activities including mobilization, shop drawings and submittals, fabrication and delivery of materials and equipment.
 - f. Submittal Review Time: Include review and re-submittal times indicated. Coordinate submittal review times in Construction Baseline Schedule.
 - g. Startup and Testing Time: Include not less than 7 days for startup, testing and commissioning activities.
 - h. Substantial Completion: Allow time for Government administrative procedures necessary for certification of Substantial Completion. (For more information, refer to Division 01 Specification 01 77 00 Closeout Procedures.)
8. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the 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 the effect of the following items 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) Seasonal variations.
 - 7) Environmental control.
 - 8) 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) Fabrication.
 - 5) Sample testing.
 - 6) Deliveries.
 - 7) Exterior Work
 - 8) Interior Work
 - 9) Installation.
 - 10) Tests and inspections.
 - 11) Adjusting.
 - 12) Curing.
 - 13) Building flush-out.
 - 14) Building commissioning activities.
9. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Exterior and Interior start up, Substantial Completions.

C. Joint Review, Revision, and Acceptance:

- 1. Within seven calendar days of receipt of the Contractor's proposed Construction Baseline Schedule, the Contracting Officer and Contractor shall meet for joint review, correction, or adjustment of the initial Construction Baseline Schedule. Any areas which, in the opinion of the Contracting Officer, conflict with timely completion of the project shall be subject to revision by the Contractor.
- 2. Within seven calendar days after the joint review between the Contractor and Contracting Officer, the Contractor shall revise and resubmit the Construction Baseline Schedule in accordance with agreements reached during the joint 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 the Contractor or Contracting Officer, shall be corrected by the Contractor within seven calendar days and shall not affect the contract period.
- 4. Upon acceptance of the Construction Baseline Schedule by the Contracting Officer, save the schedule as a baseline and update on a monthly basis. The construction schedule

update will be used to evaluate the Contractor's monthly applications for payment based upon information developed at the monthly Construction Schedule update meeting.

- D. Recovery Schedule: When periodic schedule update indicates the Work is 14 or more calendar days behind the current accepted schedule, a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule must also be submitted. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished.
- E. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project or Primavera.

PART 3 - EXECUTION

3.1 CONSTRUCTION SCHEDULE UPDATES

- A. Progress Meeting Updates: Provide a 2 week look-ahead schedule, derived from the currently accepted schedule, before each weekly progress meeting. Utilize the look-ahead schedule to facilitate and take notes on discussions held during the progress meeting.
- B. Monthly Schedule Updates:
 - 1. General: Update the Construction Schedule on a monthly basis to reflect actual construction progress and activities throughout the 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: The Contractor shall meet with the Contracting Officer each month at a Construction Schedule update meeting to review actual progress made through the status date of the Construction Schedule update, including dates activities were started and/or completed and the percentage of work completed on each activity started and/or completed.
 - 3. Reports: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
 - 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: The report shall include a brief description of the actual progress made during the update period; actual and potential delaying activities; any impediments to progress; issues related to inclement weather; progress toward established milestones and project float. The report shall include a brief description of the work anticipated to be performed

- in the next month. Any minor revisions to the schedule should be identified so they can be evaluated and accepted or rejected.
5. As the Work progresses, indicate Actual Completion percentage for each activity.
 6. If the schedule update shows a late finish date after the contract completion date, at a minimum, include the following in the narrative with your submission:
 - a. Any known delays.
 - b. Actions that will be taken to get back on schedule.
 - c. Pending modifications.
 - d. Impediments or constraints affecting progress.
 7. Progress Payments: The monthly updating of the currently accepted Construction Schedule shall be an integral part of the process upon which progress payments will be made under this contract. If the Contractor fails to provide schedule updates or revisions, then a portion of the monthly payment may be retained until such 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 the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.
- 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 the actual prosecution and progress of the work, the Contracting Officer will request, and the Contractor shall submit, a revision to the Construction Schedule. The Contractor may also request reasonable revisions to the currently accepted Construction Schedule in the event the Contractor's planning for the work is revised. If the Contractor desires to make changes, the Contractor shall notify the Contracting Officer in writing, stating the reason for the proposed revision. Accepted revisions will be incorporated into the currently accepted Construction Schedule for the next monthly schedule update.
 2. Procedure: If revision to the currently accepted Construction Schedule is contemplated, the Contractor or Contracting Officer shall so advise the other in writing at least seven calendar days prior to the next monthly schedule update meeting, describing the 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 the following:
 - 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.

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

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

END OF SECTION 01 32 16

SECTION 01 33 23 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This 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 the requirements.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 GENERAL SUBMITTAL PROCEDURES

- A. General: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual specific sections.
 - 1. Contracting Officer reserves the 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 them for legibility, accuracy, completeness, and compliance with Contract Documents.
 - 1. Coordinate each 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 the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Contracting Officer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- C. Submittal List: A submittal list has been attached to the end of this Specification Section. The intent is to provide an overall summary of submittal requirements and not a comprehensive list. The requirements of the individual Specification Sections, terms and conditions of the Contract still apply regardless of what is shown on the submittal list.
- D. Processing Time: Allow enough time for submittal review, including time for re-submittals, as follows. Time for review shall commence when an e-mail notification is received by the Contracting Officer (or designee) indicating the submittal has been posted on the NPS SharePoint website and is ready for review. When the Contracting Officer has completed their review, an e-mail notification will be sent to the Contractor indicating the submittal has been processed. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including re-submittals.
 - 1. Action Submittals
 - a. Initial Review: Allow 21 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required.
 - b. Re-submittal Review: Allow 21 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 the installation of an approved item and make all changes required in other elements of the work because of the substitution.
 - e. Waives all 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. CM-SPE Transmittal Form: All submittals shall be transmitted using National Park Service form CM-SPE form. The form is accessed and completed on the NPS/DSC Share-

Point Project website. No action will be taken on a submittal item unless accompanied by the CM-SPE transmittal form.

- a. Complete the general information at the top of the form.
 - b. Provide all required information based on the submittal type
 - c. Attach all related documents.
 - d. Sign the CM-SPE form in the contractor section at the bottom of the form, and select “submit” when complete.
 2. Physical samples: Complete the CM-SPE on the NPS/DSC SharePoint Project website as described above. Deliver the physical sample to the CO (or designee) on site for processing. All comments and actions will be documented on the CM-SPE form on the NPS/DSC SharePoint Project 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 an alphabetic suffix after another decimal point (e.g., .001.A).
- H. Re-submittals: Make re-submittals using the same process used with the initial submittal.
1. Note date and content of previous submittal.
 2. Note date and content of revision in the title block on the CM-SPE and clearly indicate the 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 all notations have been incorporated and, at a minimum, keep one copy of the final approved submittal on site for use during construction.
- 1.4 CONTRACTOR’S USE OF CAD FILES
- A. General: At Contractor’s written request, copies of CAD files will be provided to Contractor for Contractor’s use in connection with Project, subject to the following conditions:
1. Files will be provided as is; no format or other changes to files or changes to the 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. Include the following information, as applicable:
 - 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 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 Drawings is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - 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 a 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 CM-SPE on the NPS SharePoint website for processing and documentation of action on submitted samples.
 3. Identification: Attach label on unexposed side of Samples that includes the following:
 - 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 the 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 the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Contracting Officer will return submittal 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, but are not limited to, the following: 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 two sets of Samples. Contracting Officer will retain one Sample sets; remainder will be returned.
- D. Construction Materials: The Contractor is encouraged to submit for approval products made out of recycled or environmentally responsible material. Every effort will be made by the 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 SharePoint website.
 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 3. Informational submittals that do not comply with the requirements specified in the Contract Documents will be rejected and one copy will be returned.

- B. Coordination Drawings: Comply with the requirements specified in Section 01 31 00 "Project Management and Coordination."
- C. Contractors Construction Schedule: Comply with the requirements specified in Section 01 32 16 "Construction Schedule."
- D. Accident Prevention Plan: Comply with the requirements specified in Section 01 35 23 "Safety Requirements."
- E. Schedule of Values: Comply with the requirements specified in Section 01 32 16 "Construction Schedule."
- F. Waste Recycling Plan: Comply with the requirements specified in Section 01 74 19 "Construction Waste Management and Disposal."
- G. Quality Control Plan: Comply with the requirements specified in Section 01 40 00 "Quality Requirements."
- H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with the requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- J. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with the requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- K. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with the requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- L. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with the requirements in the Contract Documents.
- M. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with the requirements in the Contract Documents.
- N. 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 the requirements in the Contract Documents.
- O. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with the requirements in the 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.

- P. 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.
- Q. 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 the Contract Documents.
- R. 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.
- S. 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 the requirements in the Contract Documents.
- T. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with the requirements specified in Section 01 78 23 "Operation and Maintenance Data."
- U. Design Data: Prepare written and graphic information, including, but not limited to, 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.
- V. Manufacturer's Instructions: Prepare written or published information that documents 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.
- W. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Statement on condition of substrates and their acceptability for installation of product.
 2. Summary of installation procedures being followed, whether they comply with the 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.
- X. 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 CONTRACTOR'S REVIEW

- A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the 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 the back of the submittal; an incorrect format of submittals is provided; the 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 the Contractor's own risk.
- B. Action Submittals: Contracting Officer will review each submittal, generate comments on corrections or modifications required, and indicate the appropriate action on the CM-SPE Transmittal Form. The submittal will be marked in one of three ways as defined below:
 - 1. APPROVED: Acceptable with no corrections.
 - 2. APPROVED WITH NOTATIONS: Minor corrections or clarifications required. All comments are clear and no further review is required. The Contractor shall address all 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. The Contracting Officer will identify the reasons for disapproval. The 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

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
01 31 00	1.3	Division 01 documents		X						
01 32 16	1.3	Electronic Copies of all schedules and reports		X						
	1.3	Schedule of Values		X						
	1.3	Construction Baseline Schedule		X						
	1.3	CMP Reports		X						
	1.3	Construction Schedule Updates		X						
	1.3	Construction Schedule Revisions and Time Impact Analysis		X						
01 33 23	2.1	Product Data							X	
	2.1	Shop Drawings					X			
	2.1	Samples						X		
	2.1	Construction Materials							X	
	2.2	General								
	2.2	Coordination Drawings								
	2.2	Contractors Construction Schedule		X						
	2.2	Accident Prevention Plan		X						
	2.2	Schedule of Values		X						
	2.2	Waste Recycling Plan		X						
	2.2	Quality Control Plan		X						
	2.2	Storm Water Pollution Prevention Plan		X						
	2.2	Indoor Air Quality Management Plan		X						
	2.2	Qualification Data		X						
	2.2	Welding Certificates	X							
	2.2	Installer Certificates	X							
	2.2	Manufacturer Certificates	X							
	2.2	Product Certificates	X							
	2.2	Material Certificates	X							
	2.2	Material Test Reports		X						
	2.2	Product Test Reports		X						
	2.2	Research/Evaluation Reports		X						

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Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

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Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	2.2	Preconstruction Test Reports		X						
	2.2	Compatibility Test Reports		X						
	2.2	Field Test Reports		X						
	2.2	Maintenance Data								
	2.2	Design Data								
	2.2	Manufacturer's Instructions			X					
	2.2	Manufacturer's Field Reports		X						
	2.2	Permit Compliance Products								
01 35 23	1.2	Accident Prevention Plan		X						
01 40 00	1.4	Quality Control Plan		X						
01 57 19.11	1.4	Indoor Air Quality Management Plan		X						
	1.4	Product Data			X					
	1.4	Inspection and Test Reports		X						
01 57 23	1.3	UPPP								
	1.3	Inspection Schedule								
	1.3	Erosion Control Products			X					
01 67 00	1.3	Record Submittals								
01 73 40	1.2	Certificates signed by Quality Control Officer								
	1.2	Landfill Receipts	X							
01 74 19	1.4	Waste Management Plan		X						
	1.4	Progress Documentation		X						
	1.4	Waste Reduction Calculations		X						
	1.4	Records of Donations		X						
	1.4	Records of Sales		X						
	1.4	Recycling and Processing Facility Records								
	1.4	Landfill and Incinerator Disposal Records								
	1.4	Progress Payment Requirements								
	1.4	Closeout Submittals								
01 77 00	1.2	Closeout Submittals								
01 78 23	1.2	Manuals							X	
01 79 00	1.3	Instruction Program							X	
	1.3	Demonstration and Training Video							X	
01 81 13.13	1.3	Recycled Content								

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Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

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Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.3	Certified Wood		X						
	1.3	Construction IAQ Management Plans		X						
	1.3	Low Emitting Materials								
	1.3	Biopreferred Products								
01 91 14	1.6	Two-week look-ahead schedule								
	1.6	Certificates of Readiness	X							
	1.6	Contractor's Commissioning Representative Qualifications	X							
	1.6	Commissioning Plan		X						
	1.6	Pre-functional Checklists		X						
	1.6	Owner's Project Requirements								
	1.6	Functional Performance Test Forms		X						
	1.6	Owner's Project Requirements								
	1.6	List of test instrumentation, equipment, & monitoring devices								
	1.6	Deficiency Report and Resolution Record		X						
	1.6	Closeout Documentation		X						
02 41 19	1.5	Selective Demolition								
	1.5	Schedule of Selective Demolition Activities		X						
03 30 00	1.4	Cast-in-Place Concrete								
	1.4	Product Data							X	
	1.4	Design Mixtures for Each Concrete Mixture							X	
	1.4	Steel Reinforcement Shop Drawings					X			
	1.5	Material Certificates	X							
	1.5	Material Test Reports		X						
	1.5	Field Quality-Control Reports		X						
05 50 00	1.3	Metal Fabrications								
	1.3	Shop Drawings					X			
06 10 00	1.4	Rough Carpentry								
	1.4	Product Data							X	
	1.5	Material Certificates	X							
	1.5	Evaluation Reports		X						
06 16 00	1.3	Sheathing								
	1.3	Product Data							X	
	1.4	Evaluation Reports		X						

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Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

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Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
06 17 53	1.4	Shop-Fabricated Wood Trusses								
	1.4	Shop Drawings					X			
	1.4	Delegated Design Submittal								
	1.5	Qualification Data	X							
	1.5	Material Certificates	X							
	1.5	Product Certificates	X							
	1.5	Evaluation Reports		X						
06 18 00	1.4	Glued-Laminated Construction								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			
	1.5	Certificates of Conformance	X							
	1.5	Material Certificates	X							
06 42 19	1.4	Plastic-Laminate-Faced Wood Paneling								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			
	1.4	Samples for Verification						X		
	1.5	Evaluation Reports		X						
07 11 13	1.3	Bituminous Dempproofing								
	1.3	Product Data							X	
07 21 00	1.3	Thermal Insulation								
	1.3	Product Data							X	
	1.4	Product Test Reports		X						
	1.4	Evaluation Reports		X						
07 25 00	1.3	Weather Barriers								
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
	1.4	Evaluation Reports								
07 41 13.16	1.3	Standing-Seam Metal Roof Panels		X						
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
	1.3	Samples for Initial Selection						X		
	1.4	Qualification Data for Installer	X							
	1.4	Product Test Reports		X						
	1.4	Field Quality-Control Reports		X						

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Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

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Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.4	Sample Warranties for Special Warranties			X					
07 46 26	1.4	Engineered Wood Siding								
	1.4	Product Data							X	
	1.4	Samples for Initial Selection						X		
	1.4	Samples for Verification						X		
	1.5	Product Certificates	X							
	1.5	Product Test Reports		X						
	1.5	Research/Evaluation Reports		X						
	1.5	Sample Warranty for Special Warranty			X					
07 62 00	1.4	Sheet Metal Flashing and Trim								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			
	1.4	Samples for Initial Selection						X		
	1.5	Sample Warranty for Special Warranty			X					
07 84 13	1.3	Penetration Firestopping								
	1.3	Product Data							X	
	1.3	Product Schedule								
	1.4	Product Test Reports		X						
	1.5	Installer Certificates	X							
07 92 00	1.3	Joint Sealants								
	1.3	Product Data							X	
	1.3	Samples for Initial Selection						X		
	1.3	Joint Sealant Schedule								
	1.4	Manufacturer's Installation Instructions			X					
	1.4	Product Test Reports		X						
	1.4	Sample Warranties for Special Warranties			X					
08 11 13	1.5	Hollow Metal Doors and Frames								
	1.5	Product Data							X	
	1.5	Shop Drawings					X			
	1.5	Schedule								
	1.6	Product Test Reports		X						
08 52 00	1.4	Wood Windows								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

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Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.4	Samples						X		
	1.4	Product Schedule								
	1.5	Product Test Reports		X						
	1.5	Field Quality-Control Reports		X						
	1.5	Sample Warranties for Manufacturer's Warranties			X					
08 54 13	1.3	Fiberglass Windows								
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
	1.3	Samples						X		
	1.3	Product Schedule								
	1.4	Product Test Reports		X						
	1.4	Sample Warranties for Manufacturer's Warranties			X					
08 71 00	1.4	Door Hardware								
	1.4	Product Data							X	
	1.4	Door Hardware Schedule							X	
	1.5	Product Test Reports		X						
	1.5	Affidavit of Coordination								
	1.5	Sample Warranty for Special Warranty			X					
	1.6	Maintenance Data							X	
	1.6	Schedules								
08 71 13	1.5	Automatic Door Operators								
	1.5	Product Data							X	
	1.5	Shop Drawings					X			
	1.6	Qualification Data for Installer	X						X	
	1.6	Product Certificates	X							
	1.6	Field Quality-Control Reports		X						
	1.6	Sample Warranties for Manufacturer's Special Warranties			X					
	1.7	Maintenance Data								
08 80 00	1.5	Glazing								
	1.5	Product Data							X	
	1.5	Glazing Schedule								
	1.6	Product Certificates for Glass	X							

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.6	Product Test Reports		X						
	1.6	Sample Warranties for Special Warranties			X					
09 29 00	1.3	Gypsum Board								
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
09 51 13	1.3	Acoustical Panel Ceilings								
	1.3	Product Data							X	
09 65 13	1.3	Resilient Base and Accessories								
	1.3	Product Data							X	
	1.3	Samples						X		
09 65 16	1.3	Resilient Sheet Flooring								
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
	1.3	Samples						X		
	1.3	Weld-Seam Samples						X		
	1.3	Product Schedule								
	1.4	Maintenance Data								
09 68 13	1.4	Tile Carpeting								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			
	1.4	Samples						X		
	1.4	Product Schedule								
	1.5	Product Test Reports		X						
	1.5	Sample Warranty for Special Warranty			X					
	1.6	Maintenance Data								
09 72 00	1.3	Wall Coverings								
	1.3	Product Data							X	
	1.3	Samples for Verification						X		
	1.4	Product Test Reports		X						
	1.5	Maintenance Data								
	1.6	Furnish Extra Materials								
09 90 00	1.4	Painting								
	1.4	Product Data							X	
	1.4	Samples for Initial Selection						X		

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.4	Samples for Verification						X		
	1.4	Product List								
	1.5	Furnish Extra Materials								
10 28 00	1.4	Toilet, Bath, and Laundry Accessories								
	1.4	Product Data							X	
	1.4	Product Schedule							X	
	1.5	Sample Warranty for Manufacturer's Special Warranty			X					
12 36 61.16	1.3	Solid Surfacing Countertops								
	1.3	Product Data							X	
	1.3	Shop Drawings					X			
	1.3	Samples for Initial Selection						X		
	1.4	Maintenance Data								
12 48 13	1.3	Product Data							X	
	1.4	Maintenance Data								
14 24 00	1.4	Hydraulic Elevators								
	1.4	Product Data							X	
	1.4	Shop Drawings					X			
	1.4	Samples for Initial Selection						X		
	1.5	Qualification Data for Installer	X							
	1.5	Seismic Qualification Certificates	X							
	1.5	Manufacturer Certificate	X							
	1.5	Sample Warranty for Special Warranty			X					
21 05 00	1.8	Common Work Results for Fire Suppression								
	1.8	Provisions of Division 01								
	1.8	Contractor's Qualifications	X							
	1.8	Designer's NICET Certification and Resume								
	1.8	Shop Drawings and Hydraulic Calculations					X			
	1.8	UPC Certificate	X							
	1.8	Written Review and Contractor Responses to Review to Architect/Engineer								
	1.8	Product Data and Sprinkler Head Layout							X	
	1.8	Shop Drawings								
22 05 00	1.6	Common Work Results for Plumbing								
	1.6	Requirements of Division 01								

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.6	Catalog Sheets								
	1.6	Product Data								
	1.6	Shop Drawings					X			
22 05 19	1.4	Meters and Gages for Plumbing Piping								
	1.4	Provisions of Division 01								
	1.4	Product Data							X	
	1.4	Manufacturer's Installation Instructions							X	
22 07 00	1.5	Plumbing Insulation								
	1.5	Provisions of Division 01								
	1.5	Product Data							X	
	1.5	Manufacturer's Installation Instructions							X	
22 10 00	1.4	Plumbing Piping								
	1.4	Product Data							X	
22 30 00	1.5	Plumbing Equipment								
	1.5	Product Data							X	
	1.5	Certified Pump Curves							X	
	1.5	Manufacturer's Installation Instructions								
22 40 00	1.5	Plumbing Fixtures								
	1.5	Product Data							X	
23 05 00	1.6	Common Work Results for HV AC								
	1.6	Requirements of Division 01								
	1.6	Catalog Sheets								
	1.6	Product Data							X	
	1.6	Shop Drawings					X			
23 05 93	1.8	Testing, Adjusting, and Balancing for HV AC								
	1.8	Balancing Agency Qualifications and Sample Balancing Forms								
	1.8	Balance Report							X	
23 07 00	1.5	HV AC Insulation								
	1.5	Product Data							X	
	1.5	Manufacturer's Installation Instructions							X	
23 09 00	1.5	HV AC Instrumentation								
	1.5	Product Data							X	
	1.5	Manufacturer's Installation Instructions							X	

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
23 09 93	1.4	Sequence of Operations for HV AC Controls								
	1.4	Diagrams Indicating Mechanical System Controlled and Control System Components							X	
	1.4	Flow Diagrams for Each Control System								
	1.5	Project Record Documents								
23 11 10	1.4	Facility Fuel Systems								
	1.4	Project Data							X	
	1.4	Test Reports		X						
	1.4	Manufacturer's Installation Instructions							X	
	1.5	Project Record Documents								
	1.5	Project and Maintenance Data							X	
	1.5	Day Tank Manual							X	
23 21 13	1.5	Hydronic Piping								
	1.5	Product Data							X	
	1.5	Welder's Certification of Compliance							X	
23 21 16	1.6	Hydronic Specialties								
	1.6	Product Data							X	
	1.6	Operation and Maintenance Data							X	
23 21 23	1.5	Hydronic Pumps								
	1.5	Product Data							X	
	1.5	Certified Pump Curves							X	
	1.6	Operation and Maintenance Data							X	
23 26 00	1.5	Terminal Heat Transfer Units								
	1.5	Product Data							X	
	1.5	Schedules of Equipment and Enclosures							X	
	1.5	Mechanical and Electrical Service Locations and Requirements								
	1.6	Project Record Documents								
	1.7	Operation and Maintenance Data							X	
23 31 00	1.5	HV AC Ducts and Casings								
	1.5	Requirements of Division 01							X	
	1.6	Closeout Procedures								
	1.6	Project Record Documents							X	
23 33 00	1.4	Air Duct Accessories								
	1.4	Shop Drawings					X			

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.4	Product Data							X	
	1.4	Manufacturer's Installation Instructions							X	
	1.4	Manufacturer's Certificate	X							
	1.5	Closeout Procedures								
	1.5	Project Record Documents								
23 34 00	1.5	HV AC Fans								
	1.5	Shop Drawings					X			
	1.5	Product Data							X	
	1.5	Fan Curves							X	
	1.5	Sound Power Levels								
	1.6	Operation and Maintenance Data							X	
23 37 00	1.5	Air Outlets and Inlets								
	1.5	Product Data			X					
	1.5	Review Requirements of Outlets and Inlets								
23 51 00	1.8	Breechings, Chimneys, and Stacks								
	1.8	Product Data			X				X	
	1.8	Shop Drawings					X			
	1.8	Engineering Data								
	1.8	Manufacturer's Installation Instructions							X	
	1.8	Manufacturer's Certificate	X							
23 52 23	1.4	Cast Iron Boilers								
	1.4	Product Data								
	1.5	Operation and Maintenance Data								
23 72 00	1.4	Air to Air Energy Recovery Equipment								
	1.4	Shop Drawings					X			
	1.4	Product Data							X	
	1.4	Fan Curves							X	
	1.4	Sound Power Levels								
	1.4	Electrical Requirements for Power Supply Wiring								
	1.4	Manufacturer's Installation Instructions							X	
	1.7	Operation and Maintenance Data							X	
23 82 16	1.4	Air Coils								
	1.4	Shop Drawings					X			

SUBMITTAL LIST

Kenai Fjords National Park, PMIS 184638, Seward Visitor Center Rehabilitation

SUBMITTAL			REQUIREMENTS (indicate with an "X")							
Spec. Sec.	Par. No.	Description	INFORMATIONAL				ACTION			
			CERT./LAB TEST	REPORT/CALC. OR PLAN	Mfg. DATA & INSTRUCTIONS		SHOP DRAWING	SAMPLE	Mfg. DATA & INSTRUCTIONS	
	1.4	Product Data							X	
	1.4	Manufacturer's Installation Instructions							X	
26 05 00	1.7	Common Work Results for Electrical								
	1.7	Inspection and Permit Certificates	X							
	1.7	Submittal Review								
	1.9	Project Record Drawings								
	1.1 0	Operation and Maintenance Data								
26 05 19	1.5	Low-Voltage Electrical Power Conductors and Cables								
	1.5	Product Data							X	
26 05 26	1.5	Grounding and Bonding for Electrical Systems								
	1.5	Product Data							X	
	1.5	Shop Drawings					X			
	1.6	Project Record Drawings								
	1.6	Test Reports								
26 05 29	1.4	Hangers and Supports for Electrical Systems								
	1.4	Product Data							X	
	1.4	Seismic Restraint Calculations					X			
26 05 33	1.6	Raceway and Boxes for Electrical Systems								
	1.6	Product Data							X	
26 05 53	1.3	Identification for Electrical Systems								
	1.3	Product Data							X	
	1.3	Manufacturer's Installation Instructions							X	
	1.3	Power One-Line Diagram and Panel Map								
	1.3	Panel Schedules							X	
	1.3	Electrical One-Line Diagrams and Panel Maps								
26 09 23	1.3	Lighting Control Devices								
	1.3	Product Data							X	
	1.3	Fixture Compatibility								
	1.3	Operation and Maintenance Data							X	
	1.4	Project Record Drawings								
26 09 33	1.4	Central Dimming Controls								
	1.4	Product Data							X	
	1.4	Dimmer Compatibility								

[illegible]

SECTION 01 35 23 - SAFETY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes establishing an effective accident prevention program and providing a safe working environment for all personnel and visitors.

1.2 SUBMITTALS

- A. Accident Prevention Plan (APP): After contract award and before the Pre-Construction conference, submit for review, an Accident Prevention 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.

1.3 QUALITY ASSURANCE

- A. Comply with contract clauses entitled "Accident Prevention" and "Permits and Responsibilities". In case of conflicts between Federal, State, and local safety and health requirements, the most stringent shall apply. Equipment or tools not meeting OSHA requirements will not be allowed on the project sites. Failure to comply with the requirements of this section and related sections may result in suspension of work.
- B. Qualifications of Employees:
 - 1. All employees must be physically and able to perform their assigned duties in a safe manner.
 - 2. Do not allow employees to perform work 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.
 - 3. Operators of vehicles, hoisting equipment, and hazardous plant equipment shall be able to understand signs, signals, and operating instructions, and be fully capable of operating such equipment. Provide operating instructions for all equipment. Newly hired operators shall be individually tested by an experienced operator or supervisor to determine if they are capable of safely operating equipment. Retain copies of all operators licenses and/or certifications onsite.

1.4 ACCIDENT REPORTING

- A. Reportable Accidents (per OSHA 29CFR 1904): A project reportable accident is defined as death, occupational disease, traumatic injury to employees or the public, fires, and property damage by accident in excess of \$100. Notify Contracting Officer immediately in the event of a reportable accident. Within 7 days of a reportable accident, fill out and forward to Contracting

Officer an Accident/Property Damage Report (Form CM-22). Form may be obtained from the Contracting Officer.

PART 2 - PRODUCTS

2.1 ACCIDENT PREVENTION PLAN (APP)

- A. The Plan shall be written to comply with OSHA and project requirements (a generic plan is not acceptable) including but not limited to the following:
 - 1. Name of responsible supervisor to carry out the program.
 - 2. Weekly and monthly safety meetings shall be documented with topic and attendees.
 - 3. First aid and rescue procedures.
 - 4. Outline of each phase of the work, the hazards associated with each major phase, and the methods proposed to provide for property protection and safety of the public, National Park Service personnel, and Contractor's employees. Identify the work included under each phase, with an Job Hazard Analysis (JHA)/Job Safety Analysis (JSA), etc.
 - 5. Training, both initial and continuing.
 - 6. Planning for possible emergency situations, such as cave-ins, earthquake, explosions,, fires, floods, power outages, slides, and wind storms. Such planning shall take into consideration the nature of construction, site conditions, and degree of exposure of persons and property.

2.2 FIRST AID FACILITIES

- A. Provide adequate facilities for the number of employees and appropriate to the hazards associated with the types of ongoing construction work at the site.

2.3 PERSONNEL PROTECTIVE EQUIPMENT

- A. Meet requirements of applicable ANSI standards. Selection shall conform to OSHA 29CFR 1926.95 Subpart E.

PART 3 - EXECUTION

3.1 EMERGENCY INSTRUCTIONS

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

3.2 FIRE AND LIFE SAFETY

- A. Comply with the requirements of NFPA 241 (Standard for Safeguarding Construction, Alteration, and Demolition Operations).

- B. Store hazardous materials in accordance with manufacturer's and OSHA 29CFR1926 Subpart D requirements. Maintain readily available, on site, MSDS/Safety Data Sheets (SDS) for each chemical.
 - 1. Immediately report all 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 the emergency response kit.

3.3 PROTECTIVE EQUIPMENT

- A. Inspect personal protective equipment daily and maintain in a serviceable condition. Clean, sanitize, and repair personal items, as appropriate, before issuing them to another individual.
- B. Inspect, maintain, and document other protective equipment and devices before use and on a periodic basis to ensure safe operation. Retain inspection documentation onsite.

3.4 SAFETY MEETINGS

- A. As a minimum, conduct one weekly 15-minute "toolbox" safety meetings. These meetings shall be conducted by a foreman or supervisor and attended by all construction personnel at the worksite. Topics need to coincide with work scheduled for the following week. Document and submit meeting minutes to the Contracting Officer within one day after the meeting.
- B. Conduct monthly safety meetings for all levels of supervision. Meetings shall be attended by all contractors and subcontractors performing work on the site. Notify the Contracting Officer of meeting dates and times. These meetings shall be used to review the effectiveness of the Contractor's safety effort, to resolve current health and safety problems, to provide a forum for planning safe construction activities, and for updating the Accident Prevention Plan. The Contracting Officers Representative will attend the meeting and enter the results of the meetings into the daily log.

3.5 HARD HATS AND PROTECTIVE EQUIPMENT AREAS

- A. A hard hat use area shall be designated by the Contractor. The hard hat area shall be posted by the Contractor in a manner satisfactory to the Contracting Officer.
- B. It is the Contractor's responsibility to require all those working on or visiting the site to wear hard hats and other necessary personal protective equipment in good repair at all times. As a minimum, maintain two hard hats and all other APP required equipment.

3.6 TRAINING

- A. First Aid: Provide adequate training to an adequate number of 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. Hazardous materials are defined as explosive,

flammable, poisonous, corrosive, oxidizing, irritating, or otherwise harmful substances that could cause death or injury.

END OF SECTION 01 35 23

SECTION 01 40 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This 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 the Contract Document requirements. The quality of all work shall be the 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 the Contract Document requirements.
- C. See Divisions 02 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 that actual products incorporated into the work and completed construction comply with requirements.
- C. Preconstruction Testing: Tests and inspections that are performed specifically for the project before products and materials are incorporated into the work to verify performance or compliance with specified criteria.
- D. Product Testing: Tests and inspections that are 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.
- E. Source Quality Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- F. Field Quality Control Testing: Tests and inspections that are performed on-site for installation of the work and for completed work.
- G. Testing Agency or Laboratory: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as “carpentry” does not imply that 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 the corresponding generic name.

1.3 CONFLICTING REQUIREMENTS

- A. Reference Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Contracting Officer for a decision before proceeding.
- B. Minimum Quality Levels: The quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Contracting Officer for a decision before proceeding.

1.4 SUBMITTALS

- A. Quality Control Plan:
 1. After contract award and before the Pre-Construction conference, submit for approval a written Contractor Quality Control (CQC) plan.
 2. If the plan requires any revisions or corrections, the Contractor shall resubmit the plan within 10 days.
 3. The Government reserves the right to require changes in the plan during the contract period as necessary to obtain the quality specified.
 4. No change in the approved plan may be made without written concurrence by the Contracting Officer.
- B. Qualification Data: For testing agencies specified in “Quality Assurance” Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- C. Contractor's Quality Control Daily Reports: Submit showing all inspections and tests on the first workday following the date covered by the report. Quality Control Supervisor shall utilize the DSC forms available by accessing the DSC Workflows website, <http://www.nps.gov/dscw/publicforms.htm>.
 1. Review CMR Dailies and reconcile any differences prior to posting CQC Dailies on the SharePoint Project Website.
- D. Test Reports
 1. Test reports shall be completed by the person performing the 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 the test was performed.
- E. Accessibility Inspection Report:

1. Fill out the applicable sections of the Accessibility Inspection Report and attach to the Quality Control Daily Report.
 2. Utilize the attached Accessibility Inspection form to document compliance with the Architectural Barriers Act Accessibility Standards (ABAAS).
 3. Inspect at various stages of construction as needed to insure the finished product meets the standards.
 4. Submit report not later than one calendar day after the inspection was performed.
- F. Off-Site Inspection Reports: Submit prior to shipment.
- G. If the CQC plan and Quality Control Daily Reports are not submitted as specified, the Contracting Officer may retain all payments until such time a plan is accepted and implemented, or may retain payments for work completed on days there are no Quality Control Daily Reports.
- H. Permits, Licenses, and Certificates: For 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 the work.

1.5 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Contractors Quality Control Staff:
1. The Contractor's Quality Control Supervisor may also perform other duties.
 2. The Contractor's designated Quality Control Supervisor shall be on the project site whenever contract work is in progress.
 3. The Contractor's job supervisory staff may be used to assist the Quality Control Supervisor supplemented, as necessary, by additional certified testing technicians.
- C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- E. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- F. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated (including Structural Tests and Special Inspections (STSI). Engineering services are defined as those performed for installations of the system, assembly, or products that are similar to those indicated for this Project in material, design, and extent.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according

to ASTM E 329; and with additional qualifications specified in individual Sections; and where required by Contract, is acceptable to the Contracting Officer.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
3. All measuring devices, laboratory equipment, and instruments shall be calibrated at established intervals against certified standards in accordance with NIST requirements. Upon request, measuring and testing devices shall be made available for use by the Government for verification tests.

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

1.6 QUALITY CONTROL

- A. The Contractor is responsible for all testing and inspections, including Structural Tests and Special Inspections (STSI), as identified in the attached STSI. Inspect and test work as needed to ensure that the 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 a qualified testing agency to perform these quality-control services.
 2. Submit the appropriate report, for each quality-control service.
 3. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 4. The Contracting Officer may designate test locations.
- B. **Manufacturer's Field Services:** Where indicated, engage a 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 that replaced work that failed to comply with the 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 the work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
 4. Submit 3 copies of the certified written report of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the 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 the following:

1. Access to the 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 use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

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

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

PART 2 - PRODUCTS

2.1 QUALITY CONTROL PLAN

A. The Quality Control Plan shall include:

1. A list of personnel responsible for quality control and assigned duties. Include each person's qualifications.
2. A copy of a letter of direction to the Contractor's Quality Control Supervisor outlining assigned duties.
3. Names, qualifications, and descriptions of laboratories to perform sampling and testing, and samples of proposed report forms.
4. Methods of performing, documenting, and enforcing quality control of all work.
5. Methods of monitoring and controlling environmental pollution and contamination as required by regulations and laws.

PART 3 - EXECUTION

3.1 OFF-SITE CONTROL

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

3.2 ON-SITE CONTROL

A. Notification:

1. Notify the Contracting Officer at least 48 hours in advance of the preparatory phase meeting.

2. Notify the Contracting Officer at least 24 hours in advance of the 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, the Contractor's Quality Control Supervisor and the foreman responsible for the feature of work shall be in attendance.
 2. Review all applicable specifications sections and drawings related to the feature of work.
 3. Ensure that copies of all referenced standards related to sampling, testing, and execution for the feature of work are available on site.
 4. Ensure that provisions have been made for field control testing.
 5. Examine the work area to ensure that all preliminary work has been completed.
 6. Verify all field dimensions and advise the Contracting Officer of discrepancies with contract documents.
 7. Ensure that necessary equipment and materials are at the project site and that they comply with approved shop drawings and submittals.
 8. Document all preparatory phase activities and discussions on the Contractor's Quality Control Daily Report.
- C. Initial Phase:
1. As soon as work begins, inspect and test a representative portion of a particular feature of work for quality of workmanship.
 2. Review control testing procedures to ensure compliance with contract requirements.
 3. Document all initial phase activities and discussions on the 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 on the same feature of work for the following reasons:
1. Quality of on-going work is unacceptable.
 2. Changes occur in the applicable quality control staff, on-site production supervision, or work crew.
 3. Work on a particular feature of work is resumed after a substantial period of inactivity.

3.3 DOCUMENTATION

- A. Maintain Quality Control Daily Reports, Daily Test Report Information Sheets, and Accessibility Inspection Reports (Forms may be downloaded from the DSC Workflows website, <http://www.nps.gov/dscw/publicforms.htm>.) of quality control activities and tests.
- B. Quality Control Daily Reports may not be substituted for other written reports required under clauses of the contract, such as Disputes, Differing Site Conditions, or Changes.

3.4 ENFORCEMENT

- A. The Contractor shall stop work on any item or feature pending satisfactory correction of any deficiency noted by the quality control staff or the 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. Comply with the Contract Document requirements for Division 01 Section "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 - REFERENCES

PART 1 - GENERAL

1.1 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 the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: Where compliance with two or more standards is specified, and the standards may establish different or conflicting requirements for minimum quantities or quality levels comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Contracting Officer for a decision before proceeding.

1.2 INDUSTRY STANDARDS

- 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 the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the 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 the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

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

1.2 DEFINITIONS

- A. Permanent Enclosure: As determined by Contracting Officer, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all 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 the Contract Sum as required.
- B. Water Service: Water from existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations without any additional permit costs..
- C. Electric Power Service: Electric power from existing system is available for use with metering and with payment of use charges. Provide connections and extensions of services as required for construction operations with any additional permit costs.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Environmental Protection: Provide environmental protection as required by agency(ies) with jurisdiction and as indicated in the Contract Documents. Coordinate with requirements of the following:
 - 1. Regulatory Requirements.
 - 2. Indoor Air Quality (IAQ) Management.
 - 3. Noise & Acoustics Management.
 - 4. Environmental Management.
 - 5. Construction Waste Management.

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 the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.
- B. Safety Barrier Fence: Orange plastic fence, minimum height, 4 feet.
- C. Barrier Tape: Yellow tape Imprinted with "CAUTION: CONSTRUCTION AREA", manufactured by Reef Industries, Inc., Houston, Texas, or approved equal.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. 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.
- C. Toilets: Sufficiently lighted and ventilated toilet facilities in weatherproof, sight proof, handicap accessible, sturdy enclosures with privacy locks.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. 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 Contracting Officer authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

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 all necessary permits.
- B. Potable water is available on site. Make connections to existing facilities as needed. Facilities must be cleaned and maintained in a condition acceptable to the NPS. At Substantial Completion, restore these facilities to condition existing before initial use.
- C. 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.
- D. Heating: Provide temporary heating 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 system will not be allowed without written authorization from Contracting Officer. When the permanent heating system is approved for use as temporary heating, pay all costs until final acceptance. Permanent heating system must 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 progress of the work. Provide ample clearance around stoves and heaters and all chimney and vent connections to prevent ignition of combustible material
 - 3. Install and maintain temporary filters when air handling equipment is used for temporary heating. 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 shall start on date of Final Acceptance.
- E. 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.
- F. Electric Power Service: Use of existing electric power service will be permitted, as long as equipment is maintained in a condition acceptable to the NPS.
 1. When temporary connections are removed, restore existing utility services to their original condition.
- G. 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.
- H. Telephone Service: No telephone service is available on site for Contractor's use. Make arrangements with Telephone Company and pay all 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. 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 at all times
- C. Parking: Use areas of existing parking areas within project limits for construction personnel.
 - D. 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 a 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.
 - E. Temporary Signs: 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.
 - F. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of agency(ies) with jurisdiction.
 - G. 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.
 - H. 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, despite such protection, stairs become damaged, restore damaged areas so no evidence remains of correction work.
 - I. 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 that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- B. Cleaning of Equipment: The Contractor shall ensure that prior to moving on to the Project Area, all equipment, is free of soil, seeds, vegetative matter, or other debris that could contain or hold seeds. Ensure that all equipment has been pressure washed and is free of exotic species prior to start-up of operations and moving of equipment to Project Area. Equipment shall be considered free of soil, seeds, and other debris when a 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. Pest Control: Follow NPS requirements and practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- E. Site Enclosure Fence: When excavation begins, furnish and install appropriate barriers in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose 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.
- F. 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.
- G. Barricades, Warning Signs, and Lights: Comply with requirements of MUTCD, part IV, 2003 edition for erecting structurally adequate barricades, including warning signs and lighting.
- H. 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.
- I. 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: A capable and qualified person shall be placed in charge of fire protection. The responsibilities shall include locating and maintaining fire protective equipment and establishing and maintaining safe torch cutting and welding procedures.
 - 2. Smoking: 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 and City of Seward.
 - 4. Develop and supervise an 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 a warning sign stating that 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 all necessary precautions to prevent fire during construction. Do not store flammable or combustible liquids in existing buildings. Provide adequate ventilation during use of volatile or noxious substances.
7. Spark Arresters: Equip all 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 the 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 the nearest extinguisher shall not exceed 75 feet.
9. Vehicles and Equipment: Provide one extinguisher on each vehicle or piece of equipment.

3.5 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To 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 a 24-hour basis where required to achieve indicated results and to 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 that is regulated as a hazardous material in accordance with 49 CFR 173, 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): The composition and characteristics of the air in an enclosed space that affect the occupants of that space. The indoor air quality of a space refers to the 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 those that impact thermal comfort such as air temperature, relative humidity and air speed.
- E. Interior final finishes: Materials and products that will be exposed to interior occupied spaces; including flooring, wall covering, finish carpentry, and ceilings.
- F. Packaged dry products: Materials and products that are installed in dry form and are delivered to the site 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 other materials which require curing.

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 the greatest extent possible, isolate and/or shut down the return side of the HVAC system during construction. When ventilation system must be operational during construction activities, provide temporary filters at all air inlets (returns) and at all locations for filters prescribed in the design.
 - 4. Contractor shall bear the 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 as necessary 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 F minimum to 90 degree F maximum continuously during the 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.
- 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 cu.ft. of outdoor air per sq.ft. of floor area while maintaining an internal temperature of at least 60 degrees F 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 the specified contaminants is conducted during or after flush-out then the flush-out process must be restarted.
 3. Install new HVAC filtration media in all locations identified to have permanent filtration in the 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 that installed materials and products are dry prior to sealing and weatherproofing the 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.
 - a. Where stored on-site 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. Site drainage: Verify that final grades of site work and landscaping drain surface water and ground water away from the building.
5. Weather-proofing: Inspect moisture control materials as they are being installed. Include the following:
 - 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 the flashing for roof, walls, windows, doors, and other penetrations.

- c. Vapor Barrier: Verify that vapor barrier is installed in accordance with the 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
- 6. Plumbing: Verify satisfactory pressure test of pipes and drains is performed before closing in and insulating lines.
 - 7. HVAC: Inspect HVAC system as specified.
 - 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

C. Schedule:

- 1. Schedule work such that absorptive materials, including but not limited to 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 the earliest possible time.

D. Testing for Moisture Content: Test moisture content of porous materials and absorptive materials to ensure that 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. 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 < 20% at center of piece; < 15% at surface.

END OF SECTION 01 57 19.11

SECTION 01 57 23 – UNDER-AN-ACRE POLLUTION PREVENTION

PART 1 - GENERAL

1.1 SUMMARY

- A. NPS Standards and Guidelines require that water quality be protected at all times to ensure compliance with the Organic Act. The work of this section consists of implementing measures to Temporary Storm Water Pollution during construction activities, either through compliance with the NPDES permit program; or in conformance with NPS guidance.

1.2 DEFINITIONS

- A. 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 the utility of the environment for aesthetic, cultural, or historical purposes.

1.3 QUALITY ASSURANCE

- A. Orientation Meeting: The Contractor shall be responsible for arranging and conducting a Pollution Prevention meeting/briefing to inform all parties scheduled to be on-site during the project of the measures to be implemented for proper pollution prevention and control (may be included as part of the Pre-Construction Meeting).
 - 1. Installation of silt fences, storm drain protection, and all other forms of pollution prevention controls shall not begin until after this meeting has occurred.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.1 ENVIRONMENTAL PROTECTION

- A. Protection of Natural Resources: Comply with applicable regulations and these specifications. Preserve the natural resources within the project boundaries and outside the limits of work performed under this Contract in their existing condition or restore to an equivalent or improved condition as approved by the CO.
- B. Construction Zone: Arrange construction activities to minimize pollution (i.e., erosion, trash, etc.) to the maximum practical extent.

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

3.2 SITE INSPECTIONS

- A. Inspections: The Contractor shall perform a weekly inspection of the site.
 1. The inspection shall include disturbed areas that have not been completely stabilized, areas used for storage of materials, locations where vehicles enter or exit the site, and all other erosion and sediment controls that are included in the Plan.
 2. Inspections shall be documented.
 3. The inspection forms shall be retained onsite throughout the construction period.
- B. Negligence: Provide additional temporary erosion and pollution controls made necessary by Contractor's errors or negligence at no additional cost to the Government.

3.3 EROSION CONTROL MEASURES

- A. Erosion control measures shall consist of any and all BMPs for storm water discharges, including but not limited to 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 to control run-on and run-off into other areas, including creeks, streams, marshes, access roads, well areas, and the staging areas.
- C. Erosion control measures shall be used to contain only direct precipitation in the construction zone. The contained water shall be allowed to percolate into the ground or drain slowly through the drainage filter sediment traps.
- D. Earthen sediment traps or holding ponds shall not be used unless accepted by the CO.
- E. Reduce runoff velocity as well as direct surface runoff around and away from all fuel containment, storage, and borrow areas.
- F. Divert surface runoff around and away from cut and fill slopes.
- G. Place drainage filters around all catch basins to create sediment traps to control run-off from the construction area.
- H. Excess water used for dust control shall be contained within the demolition areas by the erosion control measures.

- I. The Contractor shall prevent the deposition of materials onto paved areas. The Contractor shall inspect the paved areas for deposited materials weekly and remove the materials immediately.
- J. Furnish, install, maintain, and operate necessary control measures and other equipment necessary to prevent erosion.
- K. Before the work begins, sufficient equipment shall be available on the site to assure that the operation and adequacy of the erosion control system can be maintained.

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

3.5 REPORTING

- A. If a discharge occurs or if the project receives a written notice or order from any regulatory agency, the Contractor will immediately notify the CO and will file a written report to the Agency(ies) with Jurisdiction within 7 days of the discharge event, notice, or order. Corrective measures shall be implemented immediately following the discharge, notice, or order. The report to the Agency(ies) with Jurisdiction shall contain the following items at a minimum:
 - 1. The date, time, location, nature of operation, and type of discharge, including the cause or nature of the notice or order.
 - 2. The BMPs deployed before the discharge event, or prior to receiving the notice or order.
 - 3. The date of deployment and type of BMPs deployed after the discharge event, or after receiving the notice or order, including additional BMPs installed or planned to reduce or prevent re-occurrence.
 - 4. An implementation and maintenance schedule for any affected BMPs.

3.6 SEDIMENT DISPOSAL

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

3.7 REMOVAL OF TEMPORARY POLLUTION CONTROL MEASURES

- A. All temporary control measures shall be removed with permission of the CO within 10 working days after final acceptance of the project, and/or once grading is completed and slopes have stabilized.

END OF SECTION 01 57 23

SECTION 01 67 00 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This 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 the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "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, that is current as of date of the 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 that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the 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. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Definitions pertaining to sustainable development: As defined in ASTM E2114.
- D. 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: The amount of biobased carbon in the material or product as a percentage of weight (mass) of the total organic carbon in the material or product.

- E. Chain-of-Custody: Process whereby a product or material is maintained under the physical possession or control during its entire life cycle.
- 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 for more information <http://www.epa.gov/oppt/epp/>.
- G. Stewardship: Responsible use and management of resources in support of sustainability.
- H. Sustainability: The maintenance of ecosystem components and functions for future generations.
 - 1. 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 with ISO 140001 Standard for the Use of Environmental Marketing Claims.
 - 2. Rapidly Renewable Material: Material made from plants that are typically harvested within a ten-year cycle.
 - 3. Regional Materials: Materials that are manufactured and extracted, harvested, or recovered within a radius of 500 miles from the Project location.

1.3 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.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will 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 to 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 an 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 the Contract Documents and to ensure that products are undamaged and properly protected.
 - 5. Contractor is encouraged to obtain materials in biodegradable or recyclable/reusable packaging which uses the minimum amount of packaging possible.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.

2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a 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 a well-drained area on solid surfaces to prevent mixing with foreign matter.

1.5 PACKAGING

- A. Where Contractor has the option to provide one of the 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.

1.6 ENVIRONMENTALLY PREFERABLE PRODUCTS

- A. Provide environmentally preferable products to the greatest extent possible.
 1. To the greatest extent possible, provide products and materials that have 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 the use of ozone depleting compounds during and after construction where alternative environmentally preferable products are available, consistent with either the Montreal Protocol and Title VI or the 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 the total value of the materials in the project.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 - 1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 - 2. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a 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 the Specifications, prepare a written document using appropriate form properly executed.
 - 3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are 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 that have been produced and used successfully in similar situations on other projects.
 - 3. Government reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Contracting Officer will make selection.
 - 5. Where products are accompanied by the term "match sample," sample to be matched is Governments.
 - 6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
- B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements or approved equal.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements or approved equal.
3. Products: Where Specifications include a 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 a 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 a 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 a 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 that sizes, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide the specified product, system, or approved equal.
8. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the 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 that are based on the product named.
9. Visual Matching Specification: Where Specifications require matching an established Sample, select a 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 the 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 the 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 the 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 the following conditions are not satisfied, Contracting Officer will return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that 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

AFFIRMATIVE PROCUREMENT REPORTING FORM
Recycled Content Materials & Biobased Content Materials

Project Name: _____ Project Number: _____
 Contractor Name: _____ License Number: _____
 Contractor Address: _____

Product	Total \$ value provided	Total \$ value w/ recycled content Pre- consum- er	Total \$ value w/ recycled content Post- consum- er	Total \$ value w/ biobased content	Exempted indicate 1,2,3,4	Comments
Hydraulic Mulch (paper based)						
Hydraulic Mulch (wood based)						
Compost						
Parking Stops (Concrete w/ fly ash, slag cement or low cement con- tent)						
Parking Stops (Plastic/Rubber)						
Patio Blocks/Rubber						
Patio Blocks/Plastic						
Playground Sur- faces						
Concrete w/ fly ash						
Concrete w/ slag cement						
Concrete w/ low cement content						
Plastic lumber						
Building Insula- tion						
Rock Wool						
Fiber glass						
Cellulose						
Perlite Comp Board						
Plastic Rigid Foam						
Glass Fiber Reinf						

Foam						
Phenolic Rigid Foam						
Ceramic tile						
Resilient flooring						
Floor Tiles/Rubber						
Floor Tiles/Plastic						
Running Tracks						
Carpet (PET)						
Paint						
Reprocessed Latex Paint White & Light Colors						
Reprocessed Latex Dark Colors						
Consolidated Latex Paint						
toilet/shower partitions (plastic or steel)						
Other						

CERTIFICATION

I hereby certify the information provided herein is accurate and that the requisition/procurement of all materials listed on this form comply with current EPA standards for recycled/recovered materials content. The following exemptions may apply to the non-procurement of recycled/recovered content materials:

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

Signature: _____ Date: _____

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

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

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

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

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

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 the earliest feasible time, and complete without delay.
 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.
 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 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. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 01 73 29

SECTION 01 73 40 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Coordination with utility service providers.
 - 2. Construction layout.
 - 3. Field engineering and surveying.
 - 4. General installation of products.
 - 5. Progress cleaning.
 - 6. Starting and adjusting.
 - 7. Protection of installed construction.
 - 8. Correction of the Work.

1.2 SUBMITTALS

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The 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: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the 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 the following Utility Service providers, sufficiently in advance to avoid delaying the work, to coordinate the contractor's portion of the work, testing requirements, inspections.
1. Electrical: Service Contact: Contact Chugach Electric to coordinate Electrical service requirements.
 2. Water Service Contact: Contact City of Seward to coordinate Water service requirements.
 3. Wastewater Service Contact: Contact City of Seward to coordinate Wastewater service requirements.

3.3 PREPARATION

- A. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the 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 the need for clarification of the Contract Documents caused by differing field conditions outside the control of the Contractor, submit a request for information to the Contracting Officer in accordance with Division 01 Specification 01 31 00 "Project Management and Coordination".

3.4 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the existing benchmarks. If discrepancies are discovered, notify Contracting Officer promptly.
- B. General: Lay out the 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 the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify the Contracting Officer when deviations from required lines and levels exceed allowable tolerances.
- C. 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.
- D. Record Log: Maintain a 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 the log available for reference by NPS.

3.5 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations. Controls that are destroyed by Contractor will be replaced by the Contractor at their expense.
 - 1. Existing Monuments: All bench marks, land corners, and triangulation points, established by other surveys, existing within the construction area shall be preserved. If existing monuments interfere with the work, secure written permission before removing them.

3.6 INSTALLATION

- A. General: Locate the Work and components of the 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 that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that 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 the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by the Contracting Officer.
 - 2. Allow for building movement, including 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, that are to be embedded in concrete or masonry. Deliver such items 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 the best visual effect. Fit exposed connections together to form hairline joints.
- I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.7 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. 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 NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather.
 - 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 the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the 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 that are not hazardous to health or property and that will not damage exposed surfaces.
1. Utilize non-toxic cleaning materials and methods.
 - a. Comply with 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 as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. 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 the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
- K. Final Cleaning: At completion of Work, remove all remaining waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces; 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 a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "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 Division 01 Section "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 their specified condition.
- C. Remove and replace damaged surfaces that are 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

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction] waste.
 - 2. Recycling nonhazardous demolition and construction] waste.
 - 3. Disposing of nonhazardous demolition and construction waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Solid Waste: Garbage, debris, sludge, or other discharged material (except hazardous waste) including solid, liquid, semisolid, or contained gaseous materials resulting from domestic, industrial, commercial, mining, or agricultural operations.
- D. Debris: Non-hazardous solid waste generated during the construction, demolition, or renovation of a structure which exceeds 2.5 inch (60 mm) 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 the 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: The presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances; or degrade the utility of the environment for aesthetic, cultural, or historical purposes.
- G. Garbage: Refuse and scraps resulting from preparation, cooking, dispensing, and consumption of food.
- H. Hazardous Materials: Any material that is regulated as a hazardous material in accordance with 49 CFR 173, 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.

- 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. Factors that contribute to waste such as over packaging, improper storage, ordering error, poor planning, breakage, mishandling, and contamination shall be minimized. A Waste Management Plan shall be developed to ensure that existing site and building materials are reused, salvaged, or recycled. Waste disposal in landfills shall be minimized.
- B. Salvage /Recycle Requirements: Develop waste management plan that results 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, and particle board
 - 4. Concrete (can be ground and used for fill on site)
 - 5. Cardboard, paper, packaging, newsprint
 - 6. Metals (from banding, stud trim, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze)
 - 7. Gypsum drywall—unpainted
 - 8. Non-hazardous paint and paint cans
 - 9. Beverage containers: Aluminum, glass, and plastic containers
 - 10. Insulation
 - 11. Ceiling grid and tiles
 - 12. Ductwork
 - 13. Wiring
 - 14. Other mixed construction and demolition waste as appropriate
- C. If any waste materials encountered during the deconstruction/demolition or construction phase are found to contain lead, asbestos, 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 the deconstruction/demolition phase shall be reused in the 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 the quality standards set forth in these specifications. Contractor shall ensure that the 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 the Contracting Officer may designate other objects or materials for reuse.
- E. Salvage/Recycle Requirements: Government goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible including the following materials:

1. Doors, frames and trim
2. Oak trim
3. Baseboard cabinets

1.4 SUBMITTALS

- A. Waste Management Plan: After award of contract and prior to the scheduled Pre-Construction Conference, Contractor shall submit a draft Waste Management Plan to the Contracting Officer for approval. Submit 1 copy of plan. Revise and resubmit Plan as required by the Contracting Officer. Approval of Contractor's Plan will not relieve Contractor of responsibility for compliance with applicable environmental regulations.
- B. Progress Documentation: Supplemental to the Waste Management Plan, document solid waste disposal, diversion, and cost/revenue analysis and submit completed worksheet on a monthly basis. Use Appendix A - Project Waste Management Plan Worksheet, and report totals to date for all column headings. Use Appendix B for solid waste volume to weight conversions.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit one copy 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. Progress payment requirements:
 1. With each Application for payment, submit 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.
- I. Closeout Submittals
 1. With Closeout Submittals, submit a summary of the Project Waste Management Plan worksheet for solid waste disposal and diversion. Submit on form in Appendix A of this Section.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Waste Management Meeting: Conduct separate meeting or cover in the Pre-Construction Conference and comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:
 - 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 and construction 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 that will be salvaged and reused in this 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.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by the Contracting Officer. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Waste Management Coordinator: Designate a waste management coordinator responsible for implementing, monitoring, and reporting status of waste management work plan.
- 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 7 days of submittal return.
 2. Distribute waste management plan to entities when they first 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 a specific area or areas to facilitate separation of materials for potential reuse, salvage, recycling, and return.
 2. Waste and recycling bins are to be placed near each other, and close to the point of waste generation but out of the traffic pattern.
 3. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid co-mingling of materials.
 4. Bins shall be protected during non-working hours from off-site contamination.
 5. Garbage dumpsters should be checked periodically to monitor recyclables being thrown away or if there are undocumented materials that could be recycled.
- G. Materials handling procedures: Materials to be recycled shall be protected from contamination and shall be handled, stored, and transported in a manner that meets the requirements set by the designated facilities for acceptance. Establish a defined area for the operations of each trade, especially woodcutting so that off-cuts will be 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 a 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.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

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

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
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 the ground and protect from the weather.
5. Remove recyclable waste off Governments property and transport to recycling receiver or processor.

3.4 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 of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Transport waste materials off Governments property and legally dispose of them.

END OF SECTION 01 74 19

017419 - Appendix A
Project Waste Management Plan Worksheet

Material	A Quantity Recycled (in tons)	B Quantity Salvaged or Reused (in tons)	C A + B = Total Quantity Diverted from Landfill	D Quantity To Landfill (in tons)	E C + D = Total Quantity Generated (in tons)	F Tip Fee/Ton at Landfill	G C x F = Tip Fee Savings resulting from Landfill Diversion	H Cost of Recycling (R), Salvage (S), or Reuse (Re) (Specify R, S, or Re)	I Revenue from Recycling, Salvage, or Reuse	J G - H + I = Total Cost (-) or Savings (+) from Diversion
Asphalt/Concrete										
Brick/Masonry/Tile										
Building Materials (doors, windows, fixtures, shingles, lumber, insulation, sheetgoods, etc.)										
Carpet										
Carpet Padding, Foam Only										
Cardboard										
Ceiling Tile										
Drywall										
Glass										
Scrap Metal										
Aluminum										
Copper										
Steel										
Unpainted Wood & Pallets										
Yard Trimmings, Brush, Trees, Stumps, etc.										
Garbage/Trash										
Other										
Column Totals	Total Quantity Recycled	Total Quantity Reused or Salvaged	Total Quantity Diverted from Landfill	Total Quantity To Landfill	Total Quantity Generated		Tip Fee Savings from Diversion	Total Cost of Recycling, Salvage, or Reuse	Revenue from Recycling, or Salvage, or Reuse	Total Cost (-) or Savings (+) from Diversion

Percentage Diverted = _____ (C divided by E from Column Totals) Should meet specified diversion requirement.

<Insert Park and PMIS number>

*See Appendix B for Standard Solid Waste Volume to Weight Conversions

017419-A1

STANDARD SOLID WASTE CONVERSIONS

The following sections provide conversions for solid waste and recyclable materials. Section 1 provides formulas to convert solid waste volume (cubic yards) into tons. Section 2 includes conversion factors to estimate the volume and weight of a number of solid waste and recyclable materials.

1. To convert cubic yards to tons:

A: For un-compacted trash, to convert the units of cubic yards into tons, using the standard density of trash value of 250 pounds per cubic yard:

Using “X” cubic yards, multiply by 250 pounds per cubic yard, divide by 2000 pounds per ton, to obtain value in tons.

$$\text{“X” cubic yards} \times \frac{250 \text{ pounds}}{\text{cubic yard}} \div \frac{2000 \text{ pounds}}{1 \text{ ton}} = \text{_____ tons}$$

This equals:

$$\text{“X” cubic yards} \times 0.125 \frac{\text{tons}}{\text{cubic yard}} = \text{_____ tons}$$

In this case, 8 cubic yards = one ton.

B: To determine your own density value for un-compacted trash (instead of using the standard value of 250 pounds per cubic yard), using a 32 gallon trash can:

- (1) Weigh the trash can both filled and empty (use a full 32 gallon trash can filled with trash roughly level to the top);
- (2) Subtract the empty weight from the filled weight to get the weight of trash (filled weight – empty weight = weight of trash);
- (3) Use the formula, using “Y” your weight of trash (pounds), divided by 0.15 cubic yards per 32 gallon trash can, to obtain your value in pounds per cubic yard; which equals:

$$\frac{\text{“Y” pounds}}{32 \text{ gallon can}} \div \frac{0.15 \text{ cubic yards}}{32 \text{ gallon can}} = \text{_____} \frac{\text{pounds}}{\text{cubic yard}}$$

- (4) Substitute this value for the 250 pounds per cubic yard value in Method A above.

This would be the more accurate measure of your park’s specific waste.

C: For compacted trash, to convert cubic yards into tons:

To use a compaction ratio, multiply the appropriate ratio times the un-compacted trash weight in Formula A to obtain the compacted trash weight.

$$\text{“X” cubic yards} \times \frac{3}{1} (\text{compaction ratio}) \times \frac{250 \text{ pounds}}{\text{cubic yard}} \times \frac{1 \text{ ton}}{2000 \text{ pounds}} = \text{_____ tons}$$

Typical compaction ratios for trash:

<Insert Park and PMIS number>

017419B-1

STANDARD SOLID WASTE CONVERSIONS

3:1 (typical)
 4:1 (higher-compaction vehicles)

If you or your hauler don't know the compacting ratio, the typical values for compacted trash are 500 to 1000 lbs./cubic yard, average 700 lbs./cubic yard. **Use 700 lbs. per cubic yard if you don't have more accurate records.**

For compacted trash, 0.4 is used instead of 0.125 in Formula A:

$$\text{"X" cubic yards} \times 0.4 \frac{\text{tons}}{\text{cubic yard}} = \text{_____ tons}$$

D: To convert container size to cubic yards for un-compacted waste:

If you don't have size and weight information on your specific containers, then these typical values can be used:

1 cubic yard = 202 gallons
 32 gallon can = 0.15 cubic yards
 60 gallon tote = 0.30 cubic yards
 90 gallon tote = 0.45 cubic yards

2. EPA's Standard Volume-to-Weight Conversion Factors

Category	Recyclable Materials (u/c = uncompact/ compacted & baled)	Volume	Estimated Waste (in pounds)
FOOD SCRAPS ^A	Food scraps, solid and liquid fats	55-gal drum	412
GLASS	Bottles ^B		
	Whole Bottles	1 yd ³	500-700
	A. Semicrushed Crushed	1 yd ³	1,000-1,800
	(mechanically)	1 yd ³	1,800-2,700
	Uncrushed to manually broken	55-gal drum	300
	Refillable Whole Bottles ^C		
	Refillable beer bottles	1 case = 24 bottles	10-14
	Refillable soft drink bottles	1 case = 24 bottles	12-22
	8 oz glass container	1 case = 24 bottles	12
LEAD-ACID BATTERIES	Car ^D	1 battery	39.4 lb
	Truck ^E	1 battery	53.3 lb lead and plastic
	Motorcycle ^E	1 battery	9.5 lb lead and plastic

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Waste (in pounds)
METALS	Aluminum Cans ^F		
	Whole	1 yd ³	50-75
	Compacted (manually)	1 yd ³	250-430
	Uncompacted	1 full grocery bag	1.5
		1 case = 24 cans	0.9
	Ferrous (tin coated steel cans) ^G		
	Whole	1 yd ³	150
	Flattened	1 yd ³	850
	Whole	1 case = 6 cans	22
	Major Appliances ^E		
	Air conditioners (room)	1 unit	64.2
	Dishwashers	1 unit	92
	Dryers (clothes)	1 unit	130
	Freezers	1 unit	193
	Microwave ovens	1 unit	50
	Refrigerators	1 unit	181.1
	Ranges	1 unit	267
	Washers (clothes)	1 unit	177
	Water heaters	1 unit	131
PAPER	Newspaper ^F		
	Uncompacted	1 yd ³	360-505
	Compacted/baled	1 yd ³	720-1,000
	12 in. stack	-	35
	Old Corrugated Containers ^F		
	Uncompacted	1 yd ³	50-150 (300) ¹
	Compacted	1 yd ³	300-500
	Baled	1 yd ³	700-1,100
	Computer Paper ^F		
	Uncompacted	1 yd ³	655
	Compacted/baled	1 yd ³	1,310
	1 case	2,800 sheets	42
	White Ledger ^F		
	Stacked (u/c)	1 yd ³	375-465/755-925
	Crumpled (u/c)	1 yd ³	110-205/325
	Ream of 20# bond; 8.5"x11"	1 ream = 500 sheets	5
	Ream of 20# bond; 8.5"x14"	1 ream = 500 sheets	6.4
	White ledger pads	1 case = 72 pads	38
	Tab Cards ^F		
	Uncompacted	1 yd ³	605
	Compacted/baled	1 yd ³	1,215-1,350
	Miscellaneous Paper		
	Yellow legal pads ^F	1 case = 72 pads	38
	Colored message pads ^F	1 carton = 144 pads	22
	Telephone directories ^H	1 yd ³	250
	Mixed Ledger/Office Paper ^F		
	Flat (u/c)	1 yd ³	380/755
	Crumpled (u/c)	1 yd ³	110-205/610

Category	Recyclable Materials (u/c = uncompacted/ compacted & baled)	Volume	Estimated Waste (in pounds)
PLASTIC ^J	PET (Soda Bottles) Whole bottles (uncompacted) Whole bottles (compacted) Whole bottles (uncompacted) Baled Granulated Granulated 8 bottles (2 L size) HDPE (Dairy) Whole (uncompacted) Whole (compacted) Baled HDPE (Mixed) Baled Granulated Granulated Other Plastic Uncompacted Compacted/baled Mixed PET and HDPE (Dairy) Whole Film Baled Baled	1 yd ³ 1 yd ³ gaylord 30" x 62" semiload gaylord 16 L 1 yd ³ 1 yd ³ 32" x 60" 32" x 60" gaylord semiload 1 yd ³ 1 yd ³ 1 yd ³ semiload 30" x 42" x 48"	30-40 515 40-53 500-550 30,000 700-750 1 24 270 400-500 900 800-1,000 42,000 50 400-700 32 50 400-700
TEXTILES ^H	Mixed Textiles	1 yd ³	175
TIRES	Car Tires Whole tire ^E Crumb rubber ^K Truck Tires Whole tire ^E Crumb rubber ^K	1 tire 1 tire 1 tire 1 tire	21 12 70 60
WOOD	Wood chips ^L Pallets ^F	1 yd ³ -	725 30-100 (40 avg)
YARD TRIMMINGS ^F	Grass Clippings Uncompacted Compacted Leaves Uncompacted Compacted Vacuumed	1 yd ³ 1 yd ³ 1 yd ³ 1 yd ³ 1 yd ³	350-450 550-1,500 200-250 300-450 350
FURNISHINGS ^E	Foam rubber mattress	1 mattress	55
MUNICIPAL SOLID WASTE ^M	Residential waste (uncompacted at curb) Commercial-industrial waste (uncompacted) MSW (compacted in truck) MSW (landfill density)	1 yd ³ 1 yd ³ 1 yd ³ 1 yd ³	150-300 300-600 500-1,000 750-1,250

- A. Information obtained from Washington State.
- B. Draft National Recycling Coalition Measurement Standards and Reporting Guidelines presented to NRC membership. October 31, 1989.
- C. Personal communication with a representative from Allwaste. November 6, 1995.
- D. Battery Council International. 1995. 1994 National Recycling Rate Study.
- E. U.S. EPA. 1995. Methodology for Characterization of Municipal Solid Waste in the United States: 1994 Update. EPA530-R-96-001. Washington, DC.
- F. U.S. EPA. 1993. Business Guide for Reducing Solid Waste. EPA530-K-92-004. Washington, DC.
- G. Personal communication with a representative from the Steel Recycling Institute. November 1, 1995.
- H. Information obtained from Massachusetts State.
- I. Information obtained from New Jersey and New York States.
- J. Personal communication with a representative from the American Plastics Council. November 2, 1995.
- K. Personal communication with a representative from the Scrap Tire Management Council. November 6, 1995.
- L. Information obtained from Northeast Forest Products, Martin Mulch Company, and the Solid Waste Association of North America.
- M. Solid Waste Association of North America, Manager of Landfill Operations Training and Certification Course. January 1989.
- N. Information obtained from New Jersey and New York States.

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 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 drafting standards to show actual construction conditions. Show additions in red, deletions in green and special instructions in blue.
- B. Keep record drawings current. Make record drawings available to the Contracting Officer for inspection at the time of monthly progress payment requests. If project record drawings are not current, the Contracting Officer may retain an appropriate amount of the progress payment.
- C. On completion of the total project, submit complete record drawings. Include shop drawings, sketches, and additional drawings that are to be included in the 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. The terms and conditions of the contract still require you to satisfy the requirements of the 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 any other similar forms or certificates.
 - 3. Project Record Documents, operation and maintenance manuals, final completion construction digital images recorded on CD-R or DVD-R with index and descriptions, and similar final record information.

4. 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 the manufacturer.
5. 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.
6. 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, such as building and room name or number.
7. Make final changeover of permanent locks and deliver keys to Contracting Officer. Advise Park personnel of changeover in security provisions.
8. Approved pre-functional checklists and functional performance testing reports from the commissioning documentation.
9. Test and balance report.
10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
11. Complete final cleaning requirements, including touchup painting.
12. Touch up and otherwise 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 a final inspection in writing when a project or designated portion of a project is substantially complete. The Contracting Officer will proceed with the inspection within 10 days of receipt of the written request or will advise the Contractor of items that prevent the project from being substantially complete.
- B. If the work is determined to be substantially complete, following the final inspection. Contracting Officer will prepare a Punch List and issue a Letter of Substantial Completion.
- C. If the work is not determined to be substantially complete following the final inspection, Contracting Officer will notify Contractor in writing. Contractor shall request a new final inspection after completing the work. Re-inspection costs may be charged against the Contractor in accordance with the Inspection of Construction contract clause.
- D. Contractor shall complete the Punch List within 30 calendar days, documented weather permitting.
 1. Prior to requesting final inspection:

- a. Complete commissioning requirements of Section<Insert Specification section>, unless approved in writing by Contracting Officer.
- E. If Contractor completes all items of work on the Punch List and all contractually required items, Contracting Officer will issue Letter of final acceptance of work.
- F. If the Contractor fails to complete the work within the time frame, the Contracting Officer may correct the work with an appropriate reduction in contract price or charge for re-inspection costs in accordance with the Inspection of Construction contract clause.

1.5 PERMIT CLOSURE AND TRANSFER

- A. When the construction work covered by the permits is complete, create a list of tasks required to close or transfer the permits to the Park. Submit to Contracting Officer for approval.
- B. After substantial completion and the Punch List has been completed, the permits shall be closed and documented by the Agency(ies) with Jurisdiction for the permit.
- C. If responsibility for permits is to be transferred to the Park, the Park shall be informed of the permit provisions completed and responsibilities that will transfer to park staff.

1.6 WARRANTIES

- A. Submittal Time: Submit written warranties on request of Contracting Officer for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the 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-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the 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 file with links enabling navigation to each item. Provide bookmarked table of contents at the beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. See Division 01 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 the 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 a 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 a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their 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 if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Touch up and otherwise 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" and similar labels, including mechanical and electrical nameplates.
 - m. Wipe surfaces of mechanical and electrical equipment[, **elevator 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 a 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 bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
 - r. Leave Project clean and ready for occupancy.
- C. Waste Disposal: Comply with requirements of Division 01 section, "Construction Waste Management and Disposal."

END OF SECTION 01 77 00

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Manuals, General.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Maintenance manuals for the care and maintenance of products, materials, finishes, systems and equipment.
- B. See Divisions 02 through 49 Sections for additional operation and maintenance manual requirements for the Work in those Sections.

1.2 SUBMITTALS

- A. Manual: Submit two copies of each manual in draft form at least 10 days before final inspection. Contracting Officer will return copy with comments within 10 days of receipt.
- B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Contracting Officer.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. Correct or modify each manual to comply with Contracting Officers comments. Submit 2 copies of each corrected manual within 10 days of receipt of Contracting Officers comments.

1.3 QUALITY ASSURANCE

- A. Coordinate with division 01 section on Commissioning. The Commissioning Agent shall review the Operation and Maintenance Manuals for systems that were commissioned.

PART 2 - PRODUCTS

2.1 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain a title page, table of contents, and manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:
 - 1. Project Title.
 - 2. Location.
 - 3. Park.
 - 4. Contract Number.
 - 5. Prime Contractors Name and Address.
 - 6. Date of Substantial Completion.
 - 7. Binder Volume number.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the 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. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
 - 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-mm) paper; with clear plastic window sleeve on front and spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Cover Sheet: Identify each binder on front and spine, with the 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 the contents of a single tabbed section covers 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 originals or clean, good quality reproductions. Copies produced by facsimile transmission and sheets with stamps, such as submittal approval stamps, will not be acceptable. Include only sheets that apply to items installed; cross out inapplicable data.
 - b. Equipment Data Sheet: Data, using form at the end of this section.
 - c. Schedules: Schedules reflecting final, as-installed conditions.

- d. Data that is poorly reproduced or in any way illegible 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 the 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 a 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, power failure and equipment failure.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of 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 this 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 the following:
 - 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 the 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 the 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: Include test and inspection instructions, troubleshooting guide, disassembly instructions, adjusting instructions and demonstration and training videotape, that detail essential maintenance and environmental procedures.
5. 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.
6. 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.
7. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.4 PRODUCT MAINTENANCE MANUAL

- A. Content: Organize manual into a 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 the 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 the following, as applicable:

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 the Project. Include: product model; manufacturer's name, address, phone, and website; and local technical representative, if any
 - a. Verify that plastic products to be incorporated into the 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 the package in question is made with a resin other than the six listed above, or is made of more than one resin listed above, and used in a multi-layer combination.
 - b. Describe maintenance procedures associated with environmentally preferable materials and systems. Provide cleaning recommendations in accordance with ASTM E1971 and the 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 the recommended maintenance procedures and materials.
 - 3) Where the proposed maintenance procedures incorporate composting of plastics, assess the potential effect of each type of plastic to be included on the composting process in accordance with ASTM D5509 or ASTM D6002
 - c. Identify take-back programs and appropriate contact information for the following:
 - 1) Carpet
 - d. Material Safety Data Sheets: Include MSDSs as specified.

- 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 would 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 information and items that detail 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, if available.
- 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 would affect validity of warranties or bonds.
 - 1. Include procedures to follow 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 an index. Install and index all data in binders within 30 days after delivery of items. As custom written data and test results are produced, add them to the operation and maintenance data file.
- B. A list of Operation and Maintenance requirements has been attached at the end of the division 01 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the 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 the Contracting Officer for inspection at the time of monthly progress payment requests. If operation and maintenance binders are not current the Contracting Officer may retain an appropriate amount of the progress payment.

3.2 MANUAL PREPARATION

- A. Manual Types
 - 1. Emergency Manual: Assemble a 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 a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
 - 3. Operation and Maintenance Manuals: Assemble a 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 but not limited to:
 - 1. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more

than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

2. Equipment Data Sheets: For each item of equipment included in the operation and maintenance data, provide an Equipment Data Sheet using the form at the end of this section. For equipment consisting of a driven machine and a driver (for example, a pump and a motor), the 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 the individual equipment items

- C. Comply with Division 01 Section "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 No.: _____ Serial No.: _____

Manufacturer Address and Phone:

Supplier Address and Phone:

Preventive Maintenance Tasks:

Nameplate Data:

Spare Parts Furnished and Other Information:

SECTION 01 79 00 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing NPS personnel, including the following:
 - 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 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.2 GENERAL REQUIREMENTS

- A. A list of System Demonstration and Training requirements has been attached at the end of the division 01 specifications for your convenience. The intent is to provide an overall summary of requirements and not a comprehensive list. The terms and conditions of the contract still require you to satisfy the requirements of the individual specification sections regardless of what is shown on the list.

1.3 SUBMITTALS

- A. Instruction Program: Submit two copies of outline of instructional program for demonstration and training, including a 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, the Contractor shall submit for approval a proposed outline of the subjects to be covered. The training shall not be conducted until the outline is approved.
- B. Demonstration and Training Video: Submit two copies of each DVD for all training sessions within seven days of end of each training module.
 - 1. Label each DVD with the date of demonstration or training, the instructor's name, and provide an index of the contents. The index shall list the start and end time of each subject covered during the training session. The sequence of the training subjects shall follow the sequence listed in the approved training outline or as actually conducted

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. 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.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:
 - 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: Include 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: Include 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: Include alignments and checking, noise, vibration, economy, and efficiency adjustments.
 - 6. Troubleshooting: Include diagnostic instructions and test and inspection procedures.
 - 7. Maintenance: Include inspection procedures, types of cleaning agents, methods of cleaning, procedures for preventive and routine maintenance, and instruction on use of special tools.
 - 8. Repairs: Include 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. Engage qualified instructors to instruct NPS personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
- B. 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 the Contracting Officer with at least seven days advance notice.
 - 2. Conduct training sessions after the equipment or system has been accepted and turned over to the Government. Coordinate with commissioning requirements.
 - 3. Individual sections specify the duration of training required. If no duration is listed, provide training of sufficient duration to adequately cover the subjects.

3.2 DEMONSTRATION AND TRAINING VIDEO

- A. General: Engage a qualified 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 each training module, record each chart containing learning objective and lesson outline.
- B. Video Format: Digital Video Disc (DVD).
- C. Video Recording: Record all of the above sessions with high resolution equipment. The instructor's voice shall be clearly audible and understandable on the DVD. Utilize a supplemental microphone worn by the 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 the training recorded again.

END OF SECTION 01 79 00

SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS FOR NON LEED™ PROJECTS

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes general requirements and procedures for compliance with the Federal Sustainability requirements. This project is not seeking LEED™ certification but shall comply with the applicable Federal Sustainability requirements. These requirements include laws (Executive Orders and regulations), management policies, building codes and standards, Federal directives, and NPS guidelines.
- B. Many of the Federal requirements can be achieved only through intelligent and integrated design of the project and are beyond the control of the Contractor. However, certain requirements relate to the products and procedures used for construction. Therefore, the full cooperation of the Contractor and subcontractors is essential to successful compliance with the Federal requirements.
- C. Contractors shall familiarize themselves with the relevant requirements and provide the necessary information and instruction to all subcontractors and installers.
 - 1. Some requirements involve quantifying percentages by weight; these require careful recordkeeping and reporting by the Contractor.
 - 2. See <http://www.nps.gov/dscw/ds-sustainability.htm> for a list of Federal Sustainability requirements. The applicable Federal Sustainability requirements are also summarized on the project's NPS Project Sustainability Checklist. Contractor is responsible for providing the necessary information in the "Construction" column of the checklist.
- D. Related Sections:
 - 1. See Divisions 01 through 49 Sections for sustainability requirements specific to the work of each of these Sections.

1.2 DEFINITIONS

- A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.
- B. LEED™: Leadership in Energy & Environmental Design. A sustainability rating system developed by the United States Green Building Council.
- C. Rapidly Renewable Materials: Materials made from plants that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

- D. Recycled Content: The recycled content value of a material assembly shall be determined by weight.
1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
 2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.
- E. Biopreferred Products: Commercial or industrial products (other than food or feed) that are composed in whole, or in significant part, of biological products, renewable agricultural materials (including plant, animal, and marine materials), or forestry materials and includes biobased intermediate ingredients or feedstocks.

1.3 FEDERAL SUSTAINABILITY DOCUMENTATION SUBMITTALS

- A. Most of the Federal sustainability documentation submittals are aggregations of submittals already required in relevant technical specifications. They are mentioned here to insure that they are collected and organized together to efficiently document compliance with sustainability requirements.
- B. Provide preliminary submittals to NPS indicating how the following Federal requirements will be met:
1. Recycled Content: List of specified/proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
 2. Certified Wood: Product data and/or chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
 3. Construction IAQ – During Construction:
 - a. Construction indoor-air-quality.
 - b. Product data for temporary filtration media.
 - c. Product data for filtration media used during occupancy.
 - d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.
 4. Construction IAQ – Before Occupancy:
 - a. Signed statement describing the building air flush-out procedures including the dates when flush-out was begun and completed and statement that filtration media was replaced after flush-out.

- b. Product data for filtration media used during flush-out and during occupancy.
- 5. Low Emitting Materials – Adhesives and Sealants: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.
- 6. Low Emitting Materials – Paints and Coatings: Product data for paints and coatings used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D.
- 7. Low Emitting Materials - Flooring: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.
- 8. BiopREFERRED Products: Provide a list of all bio-based products used on this project.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

- A. Recycled Content: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 10 percent of cost of materials used for Project.
 - 1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 2. Cost of pre-consumer recycled content of an item shall be determined by dividing weight of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
 - 3. Do not include mechanical and electrical components, and specialty items such as elevators and equipment in the calculation.

2.2 BIOPREFERRED PRODUCTS

- A. Bio-based products found the USDA BiopREFERRED Products list (<http://www.biopREFERRED.gov/>) shall be used where applicable on this project.

2.3 LOW-EMITTING MATERIALS

- A. For applications that are inside the weatherproofing system, use adhesives and sealants that comply with the VOC content limits in specification divisions 2-49
- B. For field applications that are inside the weatherproofing system, use paints and coatings that comply with the VOC content limits in specification divisions 2-49
- C. Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 MEASUREMENT AND VERIFICATION

- A. Coordinate with Divisions 2-49 for project requirements regarding the installation of building level metering equipment to measure energy, water, and electric usage.

3.2 INDOOR-AIR-QUALITY MANAGEMENT

- A. Coordinate with Section 015719.11 – Indoor Air Quality Management for managing indoor air quality during construction and prior to occupancy.

END OF SECTION 01 81 13

SECTION 01 9114 – 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.

B. The work included under this section includes a complete and thorough investigation of equipment and systems indicated in Part 3 of this section. In order to ensure proper installation and operation of all components and systems the 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 the following:

1. HVAC components, equipment, controls and sequence of operations
2. Hydronic Heating System including boiler and controls
3. Hydraulic Elevator and Controls
4. Fire Detection and Alarm

C. Building commissioning activities and documentation are described in the following reference material, ASHRAE Guideline 0-2005, The Commissioning Process, and National Institute of Building Sciences (NIBS) Guidelines.

D. The NPS personnel and Architect/Engineer are not responsible for construction means, methods, job safety, or management function related to commissioning on the job site.

E. Related Sections:

1. 01 31 00 – Project Management & 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 78 23 - Operation & Maintenance Data
6. 01 81 13 – Sustainable Design Requirements for Non LEED Projects
7. 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: A document prepared by the 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): A quality-focused process for verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, and tested to comply with Owner's Project Requirements. The requirements specified here are limited to the construction phase commissioning activities.
- D. Construction Checklist: A form used by the contractor to verify that appropriate components are on site, ready for installation, correctly installed and functional.
- E. Contractor's Commissioning Representative (CCxR): The Contractor's designated individual to coordinate, manage, and execute the commissioning processes of the contracting organizations.
- F. Commissioning Plan (CCxP): A plan that provides the structure, schedule and coordination planning for the commissioning process proposed specifically for this project. The CCxP includes Personnel, activities, and a description of the Infrastructure, and a list of all instruments and logging devices that will be used during Commissioning.
- G. Deficiency: A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents, does not perform properly or is not complying with the Basis of Design.
- H. Functional Performance Test (FPT): Test of the 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:** The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.
- K. **Owner's Project Requirements:** A document originated by the Designer that details the functional requirements of a project and the expectations of how it will be used and operated, including project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information. This document is updated, with input from the COR as required as the project is finished.
- L. **Pre-functional Checklist:** A 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 the 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 the voltage imbalance on a three-phase pump motor of a chiller system). The word “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 that are deferred until the system(s) will experience seasonal conditions closer to their design conditions.
- N. **Systems Manual:** A system focused composite document that includes the operational manual, maintenance manual, and additional information of use to the Government during the Occupancy and Operation Phase.

1.3 COMMISSIONING TEAM

- A. **Members Appointed by Contractor(s):** Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action.
 - 1. **CCxR, -The Contractor’s Commissioning Representative.** The CCxR shall be approved by the Contracting Officer (CO) and satisfy as many of the following requirements as possible:
 - a. Certified in Commissioning by a 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 the principal Commissioning Authority where the 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. Specific experience with specialty systems relative to the particular facility type.
 - 2. **CQC Supervisor – Contractor’s quality control supervisor**

3. Other Representatives - May include Project superintendents, installers, suppliers, and specialists.

B. Members Appointed by Contracting Officer (CO):

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

1.4 CONTRACTOR'S RESPONSIBILITIES

A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:

1. Perform commissioning tests, as required by the 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.
4. Integrate and coordinate commissioning process activities with the overall project schedule.
5. Review the Construction Checklist attached at the end of this specification section.
6. Complete construction checklists as contract work is completed and provide to the COR.
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 the complete range of testing for the 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 that 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. Certificates of readiness.
- B. Contractor's Commissioning Representative Qualifications.
- C. Commissioning Plan: Submit within 60 calendar days of authorization to proceed.
 - 1. Update as necessary during the work to reflect the progress on the components and systems.
- D. Pre functional checklists.
- E. Owner's project requirements.
- F. Functional performance test forms: Submit minimum 30 calendar days prior to testing
- G. List of test instrumentation, equipment, and monitoring devices. Include the following information:
 - 1. Make, model, serial number, and application for each instrument, equipment, and monitoring device.
 - 2. Brief description of intended use.
 - 3. Calibration record showing the following:
 - 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. N.I.S.T. traceability certification for calibration equipment.
 - f. Due date of the next calibration.
- H. Deficiency Report and Resolution Record: Document items of non-compliance in materials, installation or operation. Document the results from start-up/pre-functional checklists, functional performance testing, and short-term diagnostic monitoring. Include details of the components or systems found to be non-compliant with the drawings and specifications. Identify adjustments and alterations required to correct the system operation, and identify who is responsible for making the corrective changes.
 - 1. Update as necessary during the work to reflect the progress on the components and systems. Submit updated versions monthly.
- I. Closeout Documentation
 - 1. Closeout documents for commissioned equipment and systems shall be submitted prior to the functional performance testing. These include, but are not necessarily limited to:
 - a. Record Documents and Drawings
 - b. Start-up certificates for all commissioned equipment with start-up requirements.
 - c. Systems Manual
 - d. Include TAB, startup, and Control System check-out reports.

2. O&M Submittals (refer to requirements of technical specifications):
 - a. Training plan: Training plan shall include the following 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 the presenters;
 - 4) List of texts and other materials required to support training.

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

- A. Instrumentation shall meet the following standards:
 1. Be of sufficient quality and accuracy to test and measure system performance within the tolerances required to determine adequate performance.
 2. Be calibrated on the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument being used.
 3. Be maintained in good repair and operation condition throughout the duration of use on this project.
- B. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Contractor for the equipment being tested.
- C. All required commissioning equipment (sensors, transducers, data loggers, etc.) not integral to the systems or equipment installed will be provided by the Contractors Commissioning Representative, and shall not become the property of the Government.

2.2 PRE FUNCTIONAL CHECKLIST:

- A. Prepare pre functional checklists for all equipment and systems to be commissioned.
- B. The pre functional checklists shall be complementary to the Commissioning Plan and Commissioning Schedule

2.3 FUNCTIONAL TEST PROCEDURE FORMS: 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 the test procedures and expected results of the testing.

2.5 REPORT FORMAT AND ORGANIZATION

A. General Format and Organization:

1. Bind report in three-ring binders.
2. Label the front cover and spine of each binder with the 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 a 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 the following:
 - 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 the minor tab, in reverse chronological order (most recent on top).

PART 3 - EXECUTION

3.1 COMMISSIONING PROCESS

- A. The following activities outline the general commissioning tasks (requiring development, execution, etc.) and order in which they occur. Specific Commissioning requirements are found in the technical specifications sections.
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 REQUIREMENTS (TBC)

- A. TBC during the construction, acceptance, and warranty phases is intended to achieve the following specific objectives:
1. Verify that the systems and equipment meet the Owner's Project Requirements
 2. Verify that equipment is what was submitted and approved.
 3. Verify and document that equipment is installed and started per manufacturer's recommendations, industry accepted minimum standards, and the Contract Documents.
 4. Verify and document that equipment and systems receive complete operational checkout by installing contractors.
 5. Verify and document equipment capacity and system efficiency.
 6. Verify the performance of the building envelope. Document testing and conformance to the Contract Documents.
 7. Verify the completeness of operations and maintenance materials.
 8. Ensure that the Governments operating personnel are adequately trained on the 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 its intended operation, commissioning requirements, and completion and start-up schedules.
 3. Establish the scope of work, tasks, schedules, deliverables, and responsibilities for implementation of the Commissioning Plan.
 4. Attendance: Commissioning Team members.

3.4 COMMISSIONING PLAN

- A. Commissioning Plan: Develop a commissioning plan to identify how commissioning activities will be integrated into general construction and trade activities. The commissioning plan shall identify how commissioning responsibilities are distributed. The intent of this plan is to evoke questions, expose issues, and resolve issues with input from the entire commissioning team early in construction.
1. Identify who will be responsible for producing the various procedures, reports, CO notifications and forms.
 2. Include the commissioning tasks and activities in the overall project schedule. Tag individual activities so they can be filtered at a later date.
 3. List and describe each test/acceptance procedure, including the 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 the systems are complete and operational, so that the functional performance testing can be scheduled.

1. Verify equipment installed is what was approved on the Submittal.
2. Manufacturer's start-up checklists and other technical documentation guidelines may be used as the 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 the building automation system (i.e. software override of sensor inputs), trend logs of system inputs and outputs using the building automation system, or short-term monitoring of system inputs and outputs using stand-alone data loggers. A combination of methods may be required to completely test the complete sequence of operations. The 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 the 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, then all remaining units shall be tested at the Contractors' expense.
- B. Prepare functional performance test procedure forms to accommodate actual installed equipment and systems.
- C. Coordinate, execute and record the results of the functional performance testing.
 1. Coordinate retesting as necessary until satisfactory performance is verified.
 2. Verify the 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 the tests at the discretion of the CCxR. In such cases the deficiency and resolution shall be documented on the procedure form.
 2. For identified deficiencies:

- a. If there is no dispute on the deficiency and the responsibility to correct it:
 - 1) The CCxR documents the deficiency and the adjustments or alterations required to correct it. The contractor corrects the deficiency and notifies the CCxR that the equipment is ready to be retested.
 - 2) The CCxR reschedules the test and the test is repeated until satisfactory performance is achieved.
- b. If there is a dispute about a deficiency or who is responsible:
 - 1) The deficiency is documented CCxR on the non-compliance form.
 - 2) Resolutions are made at the lowest management level possible. Additional parties are brought into the discussions as needed. Contractor shall have responsibility for resolving construction deficiencies. If a design revision is deemed necessary and approved by the CO, Architect/Engineer shall have responsibility for providing design revision. The CCxR documents the resolution process.
 - 3) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CCxR that the equipment is ready to be retested. The CCxR reschedules the test and the test is repeated until satisfactory performance is achieved.

3. Cost of Retesting: Costs for retesting shall be charged to the Contractor.

3.8 OPERATIONS AND MAINTENANCE TRAINING

- A. Training: Develop a Training Plan. Coordinate and execute the training programs with the CxA.
 - 1. Stress and enhance the importance of system interactions, troubleshooting, and long-term preventive maintenance and operation programs.

3.9 DEFERRED TESTING

- A. Unforeseen Deferred Tests: If a test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon recommendation of the CCxR and the approval of the Contracting Officer. These tests are conducted in the same manner as the seasonal tests, as soon as possible.

END OF SECTION 01 91 14

SECTION 02 41 19
SELECTIVE DEMOLITION

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. Demolition and removal of selected portions of building or structure.
- 2. Demolition and removal of selected site elements.
- 3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

- 1. Section 01 10 00 "Summary of Work" for restrictions on use of the premises, Government-occupancy requirements, and phasing requirements.
- 2. Section 01 73 29 "Cutting and Patching".

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and store.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.
- E. Demolish: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Except as noted below, demolition waste becomes property of Contractor.

1. LED lamps.
2. Watt saver light switches.

1.5 INFORMATIONAL SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Government's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Coordination of Government's continuing occupancy of portions of existing building and of Government's partial occupancy of completed Work.

1.6 FIELD CONDITIONS

A. Government will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Government's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Government as far as practical.

1. Before selective demolition, Government will remove the following items:

- a. Furnishings.

C. Notify Contracting Officer's Representative of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Contracting Officer's Representative. Hazardous materials will be removed by Government under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.7 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Government's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

2.2 REPAIR MATERIALS

- A. Use repair materials identical to existing materials.
 - 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 2. Use materials whose installed performance equals or surpasses that of existing materials.
- B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review Project Record Documents of existing construction or other existing condition provided by Government. Government does not guarantee that existing conditions are same as those indicated in Project Record Documents.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
1. Arrange to shut off utilities with utility companies.
 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - f. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

- A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01 50 00 "Temporary Facilities and Controls."
- B. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches.
 - 5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 7. Dispose of demolished items and materials promptly.
- B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
- C. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Protect items from damage during storage.
 - 3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Contracting Officer's Representative, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

- B. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 07 61 13 Standing Seam Metal Roofing for new roofing requirements.

1. Remove existing roof membrane, flashings, copings, and roof accessories.
2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

- B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

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 cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Elevator pit slab..

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, 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. Vapor retarders.
 - 9. Semirigid joint filler.
 - 10. Joint-filler strips.
 - 11. Repair materials.
 - 12. Waterstops
- B. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- B. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- E. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.

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 III
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and 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 C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 3. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

- C. Waterstop: Chloroprene rubber and chloroprene rubber modified to impart hydrophilic properties. Basis of Design: Hydrotite by Greenstreak Group, Inc or approved equal.

2.7 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 - 4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 - 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.8 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.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

3. Use water-reducing admixture in pumped concrete, concrete for slabs and pits, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.9 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3,000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.50
3. Slump Limit: 5 inches plus or minus 1 inch.
4. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Elevator pit slab: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4,000 psi at 28 days.
2. Maximum Water-Cementitious Materials Ratio: 0.45.
3. Slump Limit: 5 inches plus or minus 1 inch.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.10 FABRICATING REINFORCEMENT

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

2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 1. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.

- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor bolts and rods, accurately located, to receive light framed construction.

3.3 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Contracting Officer.
 - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.5 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Contracting Officer.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.

5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

3.6 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
1. Finish and measure surface, so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 3/16 inch.

3.8 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.9 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

3.11 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's approval.

- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. 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.
1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Contracting Officer.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 2. After concrete has cured at least 14 days, correct high areas by grinding.
 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Contracting Officer's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Contracting Officer's approval.

3.12 FIELD QUALITY CONTROL

- A. Special Inspecting: No concrete special inspection is required by Owner.
- B. Testing and Quality Control (QC) Inspections: Contractor to engage a qualified testing and inspection agency to perform tests and to submit reports.
- C. QC Inspections:
 1. Steel reinforcement placement.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
- D. 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 one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 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.
 3. Slump: ASTM C 143/C 143M; one test at point of placement 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.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; 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/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

- b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
- 6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 7. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 9. Test results shall be reported in writing to Contracting Officer, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Contracting Officer but will not be used as sole basis for approval or rejection of concrete.
- 11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Contracting Officer. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Contracting Officer.
- 12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03 30 00

SECTION 05 50 00

METAL FABRICATIONS

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. Steel framing and supports for mechanical and electrical equipment.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Elevator machine beams, hoist beams.
4. Steel shapes for supporting elevator door sills.
5. Metal ladders.
6. Elevator pit sump covers.

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for the following:
 1. Steel framing and supports for mechanical and electrical equipment.
 2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
 3. Elevator machine beams, hoist beams.
 4. Steel shapes for supporting elevator door sills.

- 5. Metal ladders.

1.5 INFORMATIONAL SUBMITTALS

- A. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.
- B. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

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

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

2.2 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Wide Flange: ASTM A992.
- D. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.
- E. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
 - 2. Material: Galvanized steel, ASTM A 653/A 653M, structural steel, Grade 33, with G90 coating; 0.108-inch nominal thickness.

2.3 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- D. Post-Installed Anchors:
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing.

- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Prime miscellaneous framing and supports.

2.7 METAL LADDERS

- A. General:
 - 1. For elevator pit ladders, comply with ASME A17.1/CSA B44.
- B. Steel Ladders:
 - 1. Space siderails 18 inches apart.
 - 2. Space centerline of ladder rung 4-inches off pit wall.
 - 3. Siderails: Continuous, 3/8-by-2-1/2-inch steel flat bars, with eased edges.
 - 4. Rungs: 1-inch- diameter deformed steel bars.
 - 5. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
 - 6. Support each ladder at top and bottom with welded or bolted steel brackets.
 - 7. Prime ladders, including brackets and fasteners

2.8 ELEVATOR PIT SUMP COVERS

- A. Fabricate from 3/16-inch rolled-steel floor plate with four 1-inch- diameter holes for water drainage and for lifting.
- B. Provide steel angle supports as indicated.

2.9 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.

- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.10 STEEL AND IRON FINISHES

- A. Shop prime iron and steel items.
 - 1. Shop prime with universal shop primer unless indicated.
- B. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

END OF SECTION 05 50 00

SECTION 05 52 13

PIPE AND TUBE RAILINGS

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. Steel pipe and tube railings.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- B. Delegated-Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with flange tapped for concealed anchorage to threaded hanger bolt and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL AND IRON

- A. Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- C. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.

C. Fasteners for Interconnecting Railing Components:

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work.
2. Provide Phillips flat-head machine screws for exposed fasteners.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- F. Connections: Fabricate railings with either welded or nonwelded connections unless otherwise indicated.
- G. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- H. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.
- I. Form Changes in Direction as Follows:
 1. As detailed.
 2. By bending or by inserting prefabricated elbow fittings.
 - J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - K. Close exposed ends of railing members with prefabricated end fittings.
 - L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
 - M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 1. At brackets and fittings fastened to gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.

2.7 STEEL AND IRON FINISHES

- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 1. Shop prime uncoated railings with universal shop primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Attach railings to wall with wall brackets. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- C. Secure wall brackets and railing end flanges to building construction as follows:
 - 1. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.

3.5 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 05 52 13

SECTION 06 10 00
ROUGH CARPENTRY

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. Framing with dimension lumber.
- 2. Framing with timber.
- 3. Framing with engineered wood products.
- 4. Wood blocking, cants, and nailers.
- 5. Plywood backing panels.

B. Related Requirements:

- 1. Section 061600 "Sheathing."
- 2. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.

1.3 DEFINITIONS

- A. Exposed Framing: Framing not concealed by other construction.
- B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- C. Timber: Lumber of 5 inches nominal or greater in least dimension.
- D. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NLGA: National Lumber Grades Authority.
 - 2. WCLIB: West Coast Lumber Inspection Bureau.
 - 3. WWPA: Western Wood Products Association.

1.4 ACTION 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
- B. Evaluation Reports: For the following, from ICC-ES or equivalent service:
 - 1. Wood-preservative-treated wood.
 - 2. Engineered wood products.
 - 3. Power-driven fasteners.
 - 4. Powder-actuated fasteners.
 - 5. Metal framing anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Certified Wood: Provide statement indicating that wood product manufacturers are certified for chain of custody by an FSC-accredited certification body (Forest Certification Requirements), or a statement from material suppliers that wood products meet either Sustainable Forestry Initiative (SFI) or American Tree farm System (ATFS).
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece.
 - 3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 - 4. Provide dressed lumber, S4S, unless otherwise indicated.
- C. Maximum Moisture Content of Lumber: 15 percent
- D. 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: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that 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.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. All wood framing: No. 2 grade.

1. Species:
 - a. Spruce-pine-fir; NLGA.
 - b. Hem-fir; WCLIB, or WWPA.

2.4 TIMBER FRAMING

A. Provide timber framing complying with the following requirements, according to grading rules of grading agency indicated:

1. Species and Grade: Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; Select Structural where exposed, or No. 1 grade where not exposed; NLGA, WCLIB, or WWPA.
2. Maximum Moisture Content: 19 percent.
3. Additional Restriction: Free of heart centers.

2.5 ENGINEERED WOOD PRODUCTS

- A. Engineered Wood Products, General: Products shall contain no urea formaldehyde.
- B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.
- C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

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.
 - 3. Cants.
 - 4. Furring.
 - 5. Grounds.
- B. For items of dimension lumber size, provide No. 2 grade.
 - 1. Species:
 - a. Spruce-pine-fir; NLGA.
 - b. Hem-fir; WCLIB, or WWPA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
- E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.7 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, AC in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.
 - 1. Lead holes shall be provided for wood screws in accordance with ANSI B18.6.1 and NDS-2005 11.1.4.

2. Lead holes shall be equal to between 70% and 87% of the screw root diameter at the root of the threads.
 3. If lead holes are not provided for screws, screws shall be qualified under ICC-ES AC233 and have a currently approved ESR report available. Fastener values in ICC-ES report shall exceed typical screw values given by NDS or engineered calculations shall be provided to show that the substituted fasteners are still adequate for the imposed loads.
- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

2.9 METAL FRAMING ANCHORS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings.
- B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. 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.
- C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.
1. Use for interior locations unless otherwise indicated.
- D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 (Z550) coating designation; and not less than 0.036 inch thick.
1. Use for wood-preserved-treated lumber and where indicated.

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 furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.
- B. Framing Standard: Comply with AF&PA's WCD 1, "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. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.
- E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- F. Do not splice structural members between supports unless otherwise indicated.
- G. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- H. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- I. 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.
- J. Comply with AWPAC M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- K. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

- L. Use steel common 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 between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- M. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

3.2 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. Provide minimum 3-inch nominal bottom plate where required in shear wall schedule. Fasten plates to supporting construction unless otherwise indicated.
 - 1. For exterior walls, provide 2-by-6-inch nominal-size wood studs spaced 16 inches o.c. unless otherwise indicated.
 - 2. For interior non-bearing partitions and walls, provide 2-by-4-inch nominal-size wood studs spaced 24 inches o.c. unless otherwise indicated.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.
- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.

3.3 FLOOR JOIST 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. Attach floor joists as follows:
 - 1. Where supported on wood members, by toe nailing or by using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- C. 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.

- D. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- E. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- F. Provide solid blocking between joists under jamb studs for openings.
- G. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.

3.4 CEILING JOIST AND RAFTER FRAMING INSTALLATION

- A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal-size or 2-by-4-inch nominal-size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

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. Where beams or girders are framed into pockets of exterior concrete or masonry walls, provide 1/2-inch air space at sides and ends of wood members.
- C. Install wood posts using metal anchors indicated.
- D. Treat ends of timber beams and posts exposed to weather by dipping in water-repellent preservative for 15 minutes.

3.6 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 06 10 00

SECTION 06 16 00

SHEATHING

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. Wall sheathing.
 - 2. Roof sheathing.
 - 3. Subflooring.

- B. Related Requirements:

- 1. Section 07 25 00 "Weather Barriers" for water-resistive barrier applied over wall sheathing.

1.3 ACTION 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-preserved 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For following products, from ICC-ES:

- 1. Preservative-treated plywood.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PANEL PRODUCTS

- A. Emissions: Products shall meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Certified Wood: Provide statement indicating that wood product manufacturers are certified for chain of custody by an FSC-accredited certification body (Forest Certification Requirements), or a statement from material suppliers that wood products meet either Sustainable Forestry Initiative (SFI) or American Tree farm System (ATFS).
- C. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.
- D. Oriented Strand Board: DOC PS 2.
- E. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- F. Factory mark panels to indicate compliance with applicable standard.

2.2 PRESERVATIVE-TREATED PLYWOOD

- A. Preservative Treatment by Pressure Process: AWPAC U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
- B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

- C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.3 WALL SHEATHING

- A. Wall Sheathing: DOC PS 1 or PS 2
 - 1. Span Rating: Not less than 24/16.
 - 2. Treatment: Exterior
 - 3. Nominal Thickness: Not less than 1/2 inch.

2.4 ROOF SHEATHING

- A. Roof Sheathing: DOC PS 1 or PS 2
 - 1. Span Rating: Not less than 40/20.
 - 2. Treatment: Exterior
 - 3. Nominal Thickness: Not less than 5/8 inch.

2.5 SUBFLOORING

- A. Subflooring: Exposure 1 single-floor panels or sheathing.
 - 1. Span Rating: Not less than 48/24.
 - 2. Nominal Thickness: Not less than 3/4 inch
 - 3. Use tongue and groove panels.

2.6 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

2.7 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.
 - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

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. Arrange joints so that pieces do not span between fewer than three support members.
- 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, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- 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. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Fastening Methods: Fasten panels as indicated below:

1. Subflooring:

- a. Glue and nail to wood framing. Apply a continuous bead of glue to all framing members supporting floor sheathing panels.
- b. Use ring shank nails.
- c. In addition to specified nailing, add #8x3" screws at 12" o.c. into supporting members.
- d. Space panels 1/8 inch apart at edges and ends.

2. Wall and Roof Sheathing:

- a. Nail to wood framing.
- b. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 16 00

SECTION 06 17 53

SHOP-FABRICATED WOOD TRUSSES

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. Wood roof trusses.
 - 2. Wood truss bracing.
 - 3. Metal truss accessories.

- B. Related Requirements:

- 1. Section 06 16 00 "Sheathing" for roof sheathing and subflooring.

1.3 DEFINITIONS

- A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: Show fabrication and installation details for trusses.

- 1. Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
 - 2. Indicate sizes, stress grades, and species of lumber.
 - 3. Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 4. Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
 - 5. Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
 - 6. Show splice details and bearing details.

- B. Delegated-Design Submittal: For metal-plate-connected wood trusses indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For metal connector-plate manufacturer.
- B. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.
- C. Product Certificates: For metal-plate-connected wood trusses.
- D. Evaluation Reports: For the following, from ICC-ES:
 - 1. Metal-plate connectors.
 - 2. Metal truss accessories.

1.6 QUALITY ASSURANCE

- A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
 - 1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
 - 2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
- B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Contracting Officer and authorities having jurisdiction and is certified for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
 - 1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
 - 2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
 - 3. Provide for air circulation around stacks and under coverings.
- B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design metal-plate-connected wood trusses.
- B. Structural Performance: Provide metal-plate-connected wood trusses capable of withstanding design loads within limits and under conditions indicated. Comply with requirements in TPI 1 unless more stringent requirements are specified below.
 - 1. Design Loads: As indicated on drawings.
 - 2. Maximum Deflection Under Design Loads: As indicated on drawings.
- C. Comply with applicable requirements and recommendations of the following publications:
 - 1. TPI 1, "National Design Standard for Metal Plate Connected Wood Truss Construction."
 - 2. TPI DSB, "Recommended Design Specification for Temporary Bracing of Metal Plate Connected Wood Trusses."
 - 3. TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."
- D. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

- A. Certified Wood: For metal-plate-connected wood trusses and permanent bracing, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
 - 1. Factory mark each piece of lumber with grade stamp of grading agency.
 - 2. Provide dressed lumber, S4S.
 - 3. Provide dry lumber with 15 percent maximum moisture content at time of dressing.
- C. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 06 10 00 "Rough Carpentry."

2.3 METAL CONNECTOR PLATES

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpine Engineered Products, Inc.; an ITW company.
2. MiTek Industries, Inc.; a subsidiary of Berkshire Hathaway Inc.

B. Source Limitations: Obtain metal connector plates from single manufacturer.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 (Z180) coating designation; and not less than 0.036 inch thick.

1. Use for interior locations unless otherwise indicated.

2.4 FASTENERS

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

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

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

2.5 METAL FRAMING ANCHORS AND ACCESSORIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. 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.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 (Z180) coating designation.

1. Use for interior locations unless otherwise indicated.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.

2.7 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

- B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.
- C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.
 - 1. Fabricate wood trusses within manufacturing tolerances in TPI 1.
- D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.8 SOURCE QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform special inspections.
 - 1. Provide special inspector with access to fabricator's documentation of detailed fabrication and quality-control procedures that provide a basis for inspection control of the workmanship and the fabricator's ability to conform to approved construction documents and referenced standards.
 - 2. Provide special inspector with access to places where wood trusses are being fabricated to perform inspections.
- B. Correct deficiencies in Work that special inspections indicate does not comply with the Contract Documents.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wood trusses only after supporting construction is in place and is braced and secured.
- B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.
- C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.
- D. Install and brace trusses according to TPI recommendations and as indicated.
- E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.
- F. Space trusses 24 inches o.c.; adjust and align trusses in location before permanently fastening.
- G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

- H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.
 - 1. Install bracing to comply with Section 06 10 00 "Rough Carpentry."
 - 2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.
- I. Install wood trusses within installation tolerances in TPI 1.
- J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.
- K. Replace wood trusses that are damaged or do not meet requirements.
 - 1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Contracting Officer.

3.2 REPAIRS AND PROTECTION

- A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- C. Protective Coating: Clean and prepare exposed surfaces of metal connector plates. Brush apply primer, when part of coating system, and one coat of protective coating.
 - 1. Apply materials to provide minimum dry film thickness recommended by coating system manufacturer.

END OF SECTION 06 17 53

SECTION 06 18 00

GLUED-LAMINATED CONSTRUCTION

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 framing using structural glued-laminated timber.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.

1.3 DEFINITIONS

- A. Structural Glued-Laminated (Glulam) Timber: An engineered, stress-rated timber product assembled from selected and prepared wood laminations bonded together with adhesives and with the grain of the laminations approximately parallel longitudinally.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on lumber, adhesives, fabrication, and protection.
 - 2. For preservative-treated wood products. Include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
 - 3. For connectors. Include installation instructions.
- B. Shop Drawings:
 - 1. Show layout of structural glued-laminated timber system and full dimensions of each member.
 - 2. Indicate species and laminating combination.

1.5 INFORMATIONAL SUBMITTALS

- A. Certificates of Conformance: Issued by a qualified testing and inspecting agency indicating that structural glued-laminated timber complies with requirements in AITC A190.1.

- B. Material Certificates: For preservative-treated wood products, from manufacturer. Indicate type of preservative used and net amount of preservative retained.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A certification for chain of custody by an FSC-accredited certification body.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Comply with provisions in AITC 111.
- B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

- A. General: Provide structural glued-laminated timber that complies with AITC A190.1 and AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.
 - 1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that are not exposed in the completed Work.
 - 2. Provide structural glued-laminated timber made from single species.
 - 3. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
 - 4. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.
 - 5. Adhesive shall not contain urea-formaldehyde resins.
 - 6. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Certified Wood: Glued-laminated timber shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship," and to FSC STD-40-004, "FSC Standard for Chain of Custody Certification."
- C. Species and Grades for Structural Glued-Laminated Timber: Douglas fir-larch that complies with combination symbols indicated.
- D. Appearance Grade: Architectural, complying with AITC 110.
 - 1. For Architectural appearance grades, fill voids as required by AITC 110.

2.2 TIMBER CONNECTORS

- A. Basis-of-Design Products: Subject to compliance with requirements, provide products indicated on Drawings or comparable product.

2.3 MISCELLANEOUS MATERIALS

- A. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.
- B. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.
- C. Sealers shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.4 FABRICATION

- A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.
 - 1. Dress exposed surfaces as needed to remove planing and surfacing marks.
- B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.
- C. End-Cut Sealing: Immediately after end cutting each member to final length, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.
- D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit.

2.5 FACTORY FINISHING

- A. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.
- B. Finishing materials shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Erect structural glued-laminated timber true and plumb and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.
 - 1. Handle and temporarily support glued-laminated timber to prevent surface damage, compression, and other effects that might interfere with indicated finish.
- B. Cutting: Avoid extra cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.
- C. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.
 - 1. Predrill for fasteners using timber connectors as templates.
 - 2. Finish exposed surfaces to remove planing or surfacing marks and to provide a finish equivalent to that produced by machine sanding with No. 120 grit sandpaper.
 - 3. Coat cross cuts with end sealer.
- D. Install timber connectors as indicated.
 - 1. Unless otherwise indicated, install bolts with same orientation within each connection and in similar connections.
 - 2. Install bolts with orientation as indicated or, if not indicated, as directed by Contracting Officer.

3.3 ADJUSTING

- A. Repair damaged surfaces and finishes after completing erection. Replace damaged structural glued-laminated timber if repairs are not approved by Contracting Officer.

3.4 PROTECTION

- A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose, including protection from weather, sunlight, soiling, and damage from work of other trades.
 - 1. Coordinate wrapping removal with finishing work. Retain wrapping where it can serve as a painting shield.
 - 2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 06 18 00

SECTION 06 20 13

EXTERIOR FINISH CARPENTRY

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. Lumber soffits.

- B. Related Requirements:

- 1. Section 09 90 00 " Painting" for priming and backpriming of exterior finish carpentry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

- B. Sustainable Design Submittals:

- 1. Chain-of-Custody Certificates: For certified wood products.
 - 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.

- C. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

- D. Samples for Verification:

- 1. For each species and cut of lumber and panel products, with half of exposed surface finished; 50 sq. in. for lumber and 8 by 10 inches for panels.

1.4 INFORMATIONAL SUBMITTALS

- A. Compliance Certificates:

- 1. For lumber that is not marked with grade stamp.

- B. **Manufacturer Qualifications:** A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- C. **Vendor Qualifications:** A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

- A. **Weather Limitations:** Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. **Certified Wood:** The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004. Provide minimum 50 percent FSC certified wood.
 - 1. Exterior soffit boards.
- B. **Lumber:** DOC PS 20 and applicable rules of grading agencies indicated.
- C. **Factory mark** each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

2.2 LUMBER SOFFITS

- A. Provide kiln-dried lumber siding complying with DOC PS 20.

- B. Species and Grade: Grade A western red cedar; NLGA, WCLIB, or WWPA.
- C. Pattern: V-edge, smooth-faced tongue and groove, actual face width (coverage) and thickness of 5-1/8 by 23/32 inch.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. For face-fastening siding, provide hot-dip galvanized-steel finish nails.
- B. Flashing: Comply with requirements in Section 07 62 00 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
- C. Insect Screening for Soffit Vents: Galvanized steel mesh cloth with 0.047 inch diameter wire at 0.25 inch centers, 70 percent minimum free area.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
- B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.

2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
3. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 ADJUSTING

- A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.5 CLEANING

- A. Clean exterior finish carpentry on exposed and semiexposed surfaces.

3.6 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 13

SECTION 06 20 23

INTERIOR FINISH CARPENTRY

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. Interior trim.

- B. Related Requirements:

- 1. Section 06 10 00 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.
 - 2. Section 09 90 00 "Painting" for interior finish carpentry.

- C. Sustainable Design Submittals:

- 1. Chain-of-Custody Certificates: For certified wood products.
 - 2. Chain-of-Custody Qualification Data: For manufacturer and vendor.

1.3 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Vendor Qualifications: A vendor that is certified for chain of custody by an FSC-accredited certification body.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

- B. Deliver interior finish carpentry materials only when environmental conditions comply with requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions comply with requirements specified for installation areas.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
- B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Certified Wood: The following wood products shall be certified as "FSC Pure" or "FSC Mixed Credit" according to FSC STD-01-00 and FSC STD-40-004. Provide minimum 50 percent FSC certified wood.
 - 1. Interior trim.
- B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the American Lumber Standard Committee's Board of Review. Grade lumber by an agency certified by the American Lumber Standard Committee's Board of Review to inspect and grade lumber under the rules indicated.
 - 1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by grading agency.

2.2 INTERIOR TRIM

- A. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish):
 - 1. Species and Grade: Red oak, A Finish; NHLA.
 - 2. Maximum Moisture Content: 13 percent.
 - 3. Finger Jointing: Not allowed.
 - 4. Gluing for Width: Use for lumber trim wider than 6 inches.

5. Veneered Material: Not allowed.
6. Face Surface: Surfaced (smooth).
7. Matching: Selected for compatible grain and color.

2.3 MISCELLANEOUS MATERIALS

- A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

2.4 FABRICATION

- A. Back out or kerf backs of the following members, except those with ends exposed in finished work:
 1. Interior standing and running trim, except shoe.
- B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.
- B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

- A. Do not use materials that are unsound; warped; improperly treated or finished; inadequately seasoned; too small to fabricate with proper jointing arrangements; or with defective surfaces, sizes, or patterns.

- B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
 - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
 - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
 - 3. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining interior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
 - 4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long, except where necessary. Stagger joints in adjacent and related standing and running trim. Miter at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints. Plane backs of casings to provide uniform thickness across joints where necessary for alignment.
 - 1. Match color and grain pattern of trim for transparent finish (stain or clear finish) across joints.
 - 2. Install trim after gypsum-board joint finishing operations are completed.
 - 3. Install without splitting; drill pilot holes before fastening where necessary to prevent splitting. Fasten to prevent movement or warping. Countersink fastener heads on exposed carpentry work and fill holes.

3.5 ADJUSTING

- A. Adjust for maximum offset of true alignment with different adjacent materials to 1/32 inch.
- B. Adjust for true alignment of same materials to flush.
- C. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.6 CLEANING

- A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes if any.

3.7 PROTECTION

- A. Protect installed products from damage from weather and other causes during construction.
- B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.
 - 1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 06 20 23

SECTION 06 42 19

PLASTIC-LAMINATE-FACED WOOD PANELING

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. Plastic-laminate-faced wood paneling.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced wood paneling that is not concealed within other construction.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling that is concealed within other construction before paneling installation.

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that paneling can be installed as indicated.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sustainable Design Submittals:

1. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
2. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.
3. Product Data: For installation adhesives, indicating VOC content.
4. Laboratory Test Reports: For installation adhesives, indicating compliance with requirements for low-emitting materials.

- C. Shop Drawings: For plastic-laminate-faced wood paneling.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show details full size.
 - 3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
- D. Samples for Verification: For each type of exposed laminate, 8 by 10 inches.
 - 1. Provide one Sample applied to core material and with specified edge material applied to one edge.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of products.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between 25 and 55 percent during the remainder of the construction period.
- B. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.

- C. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PANELING, GENERAL

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of plastic-laminate-faced wood paneling (decorative laminate surfacing) indicated for construction, finishes, installation, and other requirements.

2.2 PLASTIC-LAMINATE-FACED WOOD PANELING

- A. Grade: Premium.
- B. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3 and the following requirements:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Formica Corporation.
 - b. Lamin-Art, Inc.
 - c. Wilsonart
 - 2. Faces: Grade VGS.
 - 3. Backs: Grade BKL.
 - 4. Exposed Edges: Same as faces.
- C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed surfaces complying with the following requirements:
 - 1. As indicated by manufacturer's designations.
- D. Panel Core: Composite wood and agrifiber products.
 - 1. Thickness: 5/8 inch.
- E. Adhesives for Bonding Plastic Laminate: Contact cement.
 - 1. Adhesive for Bonding Edges: Hot-melt adhesive.
- F. Assemble panels by gluing.

2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: 8 to 13 percent.
- C. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- D. Composite Wood Products: Products shall be made without urea formaldehyde.
- E. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 - 1. Straw-Based Particleboard: ANSI A208.1, Grade M-2, except for density.
- F. Metal Edge Strips: Angle or L-shaped extruded, clear anodized aluminum, thickness to match panel.
 - 1. Basis-of-Design: Fry Reglet "J" Molding.

2.4 INSTALLATION MATERIALS

- A. Adhesive:
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 FABRICATION

- A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Before installation, condition paneling to humidity conditions in installation areas.
- B. Before installing paneling, examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding 1/32 inch.
- C. Anchor paneling to supporting substrate with adhesive. Provide metal edge trim to top and bottom edges..

3.3 ADJUSTING AND CLEANING

- A. Repair damaged and defective paneling, where possible, to eliminate defects. Where not possible to repair, replace paneling. Adjust for uniform appearance.
- B. Clean paneling on exposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 06 42 19

SECTION 07 11 13
BITUMINOUS DAMPPROOFING

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. Cold-applied, emulsified-asphalt dampproofing.

- B. Related Requirements:

- 1. Section 03 30 00 "Cast-in-Place Concrete" for bituminous vapor retarders under slabs-on-grade.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE

- A. Perform work in accordance with NRCA Waterproofing and Damproofing Manual.

1.5 FIELD CONDITIONS

- A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
- B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide protection course auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

- A. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction unless otherwise indicated.

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Euclid Chemical Company (The); an RPM company.
 - 2. Henry Company.
 - 3. Karnak Corporation.
- B. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.

2.4 AUXILIARY MATERIALS

- A. Furnish auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with bituminous dampproofing.
- B. Emulsified-Asphalt Primer: ASTM D 1227, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- C. Asphalt-Coated Glass Fabric: ASTM D 1668/D 1668M, Type I.
- D. Patching Compound: Asbestos-free fibered mastic of type recommended in writing by dampproofing manufacturer.
- E. Protection Course: Extruded-polystyrene board insulation, unfaced, ASTM C 578, Type X, 2 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for surface smoothness, maximum surface moisture content, and other conditions affecting performance of the Work.
- B. Proceed with application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for dampproofing application.
- B. Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.
- C. Clean substrates of projections and substances detrimental to dampproofing work; fill voids, seal joints, and remove bond breakers if any.
- D. Apply patching compound to patch and fill tie holes, honeycombs, reveals, and other imperfections; cover with asphalt-coated glass fabric.

3.3 APPLICATION, GENERAL

- A. Comply with manufacturer's written instructions for dampproofing application, cure time between coats, and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch-wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations: Apply one fibered brush or spray coat at not less than 3 gal./100 sq. ft..

3.5 PROTECTION COURSE INSTALLATION

- A. Install protection course over completed-and-cured dampproofing. Butt joints tight. Scribe boards around projections, penetrations, and interruptions. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course within 24 hours of dampproofing installation (while coating is tacky) to ensure adhesion.

3.6 PROTECTION

- A. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- B. Correct dampproofing that does not comply with requirements; repair substrates, and reapply dampproofing.

END OF SECTION 07 11 13

SECTION 07 21 00
THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Glass-fiber blanket.
 - 2. Vapor retarders.

- B. Related Requirements:

- 1. Section 07 11 13 "Dampproofing" for foundation protection board insulation.
 - 2. Section 09 29 00 "Gypsum Board" for sound attenuation blanket used as acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- B. Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Surface Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET

- A. Glass-Fiber Blanket, Unfaced: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.2 2.25 lb/cu. ft.4.3 deg F x h x sq. ft./Btu x in. at 75 deg F3 lb/cu. ft.4.3 deg F x h x sq. ft./Btu x in. at 75 deg F4.25 lb/cu. ft.4.3 deg F x h x sq. ft./Btu x in. at 75 deg F4.25 lb/cu. ft.4.3 deg F x h x sq. ft./Btu x in. at 75 deg F6 lb/cu. ft.4.4 deg F x h x sq. ft./Btu x in. at 75 deg F6 lb/cu. ft.4.34 deg F x h x sq. ft./Btu x in. at 75 deg F4 lb/cu. ft.4 lb/cu. ft.6 lb/cu. ft.6 lb/cu. ft.8 lb/cu. ft.8 lb/cu. ft.VAPOR RETARDERS

- A. Poly Vapor Retarders: ASTM D 4397, 10 mils thick, with maximum permance rating of 0.13 perm.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.

2.3 ACCESSORIES

- A. Insulation for Miscellaneous Voids:
 - 1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
- B. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation, including removing projections capable of puncturing insulation or vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.
- E. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.
- F. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
- G. Fill all joints greater than 1/4-inch with same material.
- H. Do not compress insulation.
- I. Fit insulation tightly on cavities and tightly to exterior side of mechanical and electrical services within plane of insulation.

3.3 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. 96 inchesFor wood-framed construction, install blankets according to ASTM C 1320 and as follows:
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.4 INSTALLATION OF VAPOR RETARDERS ON FRAMING

- A. Place vapor retarders on warm side of insulation unless noted otherwise.
- B. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives, vapor retarder fasteners, or other anchorage system as recommended by manufacturer. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.
- C. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs and sealing with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Locate all joints over framing members or other solid substrates.
- D. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- E. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.5 PROTECTION

- A. Protect installed insulation and vapor retarder from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

SECTION 07 25 00
WEATHER BARRIERS

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. Building wrap/drainage material.
 - 2. Flexible flashing.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.
- B. Shop Drawings: Show details of building wrap at terminations, openings, and penetrations. Show details of flexible flashing applications.

1.4 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace membrane that do not comply with requirements or that fail in materials within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER/DRAINAGE MEMBRANE

- A. Building Wrap: Vertically channeled polypropylene drainage mesh with three-dimensional matrix bonded to a water-resistive, air infiltration barrier. Wrap shall have a flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Application: Mechanically fastened.
 - 2. Air Penetration: 0.02 L/M² maximum at 75 Pa.
 - 3. Water Vapor Transmission: 9 perms minimum, when tested in accordance with ASTM E96, Method B.
 - 4. Water Penetration Resistance: No leakage when tested in accordance with AATCC Test Method 127 with a 550 mm hydrostatic head.
 - 5. Basis Weight: Minimum 10.0 oz/yd².
- B. Basis-of-Design: Home Slicker Plus Typar by Benjamin Obdyke or approved substitution.

2.2 OPENING AND PENETRATION FLASHING

- A. Building Wrap: ASTM E 2178, Air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
 - 1. Flame Propagation Test: Materials and construction shall be as tested according to NFPA 285.
 - 2. Application: Self Adhering.
 - 3. Air Penetration: 0.001 cfm/ft² maximum at 75 Pa, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
 - 4. Water Vapor Transmission: 40 perms minimum, when tested in accordance with ASTM E96, Method B.
 - 5. Water Penetration Resistance: No leakage when tested in accordance with AATCC Test Method 127 with a 550 mm hydrostatic head.
 - 6. Basis Weight: Minimum 5.0 oz/yd².
 - 7. Tensile Strength: Minimum 38 lbs/in., when tested in accordance with ASTM D828, Method A.
 - 8. Peel Adhesion: Conforming to ASTM D 3330.
- B. Liquid Flashing: Manufacturer's standard liquid applied vapor permeable air barrier flashing material with vapor permeance and resistance to air leakage properties compatible with the primary air barrier membrane.
- C. Basis-of-Design: WrapShield SA by VaproShield or approved substitution.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Install barrier in accordance with manufacturer's written instructions.
- B. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.
- C. Cover sheathing with water-resistive barrier as follows:
 - 1. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.
- D. Building Wrap: Comply with manufacturer's written instructions and warranty requirements.
 - 1. Seal seams, edges, fasteners, and penetrations with tape.
 - 2. Extend into jambs of openings and seal corners with opening and penetration flashing.

3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
 - 1. Prime substrates as recommended by flashing manufacturer.
 - 2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
 - 3. Lap flashing over water-resistive barrier at bottom and sides of openings.
 - 4. Lap water-resistive barrier over flashing at heads of openings.
 - 5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 07 25 00

SECTION 07 41 13.16

STANDING-SEAM METAL ROOF PANELS

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 standing-seam metal roof panels.

1.3 COORDINATION

- A. Coordinate flashing and trim material supply and installation with Section 07 62 00 "Sheet Metal Flashing and Trim".

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.
- B. Shop Drawings:
 - 1. Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
 - 2. Accessories: Include details of the flashing, trim, and anchorage systems, at a scale of not less than 3 inches per 12 inches.
- C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

- C. Field quality-control reports.
- D. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Perform work in accordance with NRCA Waterproofing and Damproofing Manual.
- C. Coordinate supply of materials in this Section with Section 07 62 00 "Steel Metal Flashing and Trim.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.9 COORDINATION

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.
- B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including rupturing, cracking, or puncturing.
 - b. Deterioration of metals and other materials beyond normal weathering.
 - 2. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Special Weathertightness Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that fail to remain weathertight, including leaks, within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 1592:
 - 1. Wind Loads: As indicated on Drawings.
 - 2. Deflection Limits: For wind loads, no greater than 1/180 of the span.
- B. Air Infiltration: Air leakage of not more than 0.006 cfm/sq. ft. when tested according to ASTM E 1680 or ASTM E 283 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 1.57 lbf/sq. ft..

- C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 or ASTM E 331 at the following test-pressure difference:
 - 1. Test-Pressure Difference: 6.24 lbf/sq. ft..
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
 - 1. Uplift Rating: UL 90.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
 - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
- B. Vertical-Rib, Snap-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and intermediate stiffening ribs symmetrically spaced between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and snapping panels together.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. AEP Span; A BlueScope Steel Company.
 - b. Metal Sales Manufacturing Corporation.
 - 2. Metallic-Coated Steel Sheet: Aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
 - a. Nominal Thickness: 0.024 inch.
 - b. Exterior Finish: Three-coat fluoropolymer.
 - c. Color: As selected by Contracting Officer's Representative from manufacturer's full range.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: Stable after testing at 240 deg F; ASTM D 1970.
 - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D 1970.
 - 3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - c. Henry Company.
- B. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.4 MISCELLANEOUS MATERIALS

- A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, fasciae, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
 - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
 - 2. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- B. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels. Coordinate with Section 07 62 00 – “Sheet Metal Flashing and Trim”.
- C. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- D. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
 - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 - 2. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.
- E. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Provide panel profile, including major ribs and intermediate stiffening ribs and for full length of panel.
- C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

2.6 FINISHES

- A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Steel Panels and Accessories:
 - 1. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal panel supports, and other conditions affecting performance of the Work.
 - 1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.

2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal roof panel manufacturer.
 - a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated below, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps with roller. Cover underlayment within 14 days.
 1. Apply over the entire roof surface.
- B. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- C. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 07 62 00 "Sheet Metal Flashing and Trim."

3.3 METAL PANEL INSTALLATION

- A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.
 1. Shim or otherwise plumb substrates receiving metal panels.
 2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal panels are installed.
 3. Install screw fasteners in predrilled holes.
 4. Locate and space fastenings in uniform vertical and horizontal alignment.
 5. Install flashing and trim as metal panel work proceeds.
 6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
 7. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
 8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless-steel or coated steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.
2. Field cutting of metal panels by reciprocating saw, torch, or abrasive type cutting wheel is not permitted.
3. Arrange and nest side-lap joints so prevailing southerly winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
4. Extend roof panels 2-inches beyond eave flashings.

C. Anchor Clips: Anchor metal roof panels and other components of the Work securely in place, using manufacturer's approved fasteners according to manufacturers' written instructions.

1. Mechanically attach top of panel to plywood under ridge cap with (17) No. 14 by 1-inch screws.
2. Provide clips at minimum 1 foot on center and fasten with minimum of two No. 12 by 1-inch screws.

D. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

E. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.

1. Install clips to supports with self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Watertight Installation:
 - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
 - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.
 - c. At panel splices, nest panels with minimum 6-inch end lap, sealed with sealant and fastened together by interlocking clamping plates.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

- G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Set neck of boot in sealant and clamp with stainless steel draw band. Fasten and seal to metal roof panels as recommended by manufacturer. Conform base to panel profile.

3.4 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.
- B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.
- C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.
- B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 41 13.16

SECTION 07 46 26

ENGINEERED WOOD SIDING AND TRIM

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 treated engineered wood siding and trim materials.
- B. Related Requirements:
 - 1. Section 06 10 00 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.
 - 2. Section 07 25 00 "Weather Barriers" for weather-resistive barriers and drainage membranes.

1.3 COORDINATION

- A. Coordinate siding installation with flashings and other adjoining construction to ensure proper sequencing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Initial Selection: For treated engineered wood siding including related accessories.
- C. Samples for Verification: For each type, color, texture, and pattern required.
 - 1. 12-inch- long-by-actual-width Sample of siding.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of treated engineered wood siding .
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for treated engineered wood siding.

- C. Research/Evaluation Reports: For each type of treated engineered wood siding required, from ICC-ES.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of product, including related accessories, to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish full lengths of treated engineered wood siding including related accessories, in a quantity equal to 2 percent of amount installed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with labels intact until time of use.
- B. Store materials on elevated platforms, under cover, and in a dry location.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including cracking and deforming.
 - b. Deterioration of materials beyond normal weathering.
 - 2. Warranty Period: 50 years from date of Substantial Completion.
 - a. First five years shall cover 100 percent or repair or replacement

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain products, including related accessories, from single source from single manufacturer.

- B. Basis-of-Design Product: The design for each type of siding used is based SmartSide 76 Series by Louisiana Pacific. Subject to compliance subject to compliance with requirements, provide either the named product or a comparable product.

2.2 ENGINEERED WOOD SIDING - GENERAL

- A. General: Embossed surface hardboard complying with ANSI/AHA A135.6, with resin and linseed oil impregnated surface; acrylic exterior finish.
- B. Nominal Thickness: Not less than 0.44 inches.
- C. Fire Rating: ASTM E 84 Class C.
- D. Color: As selected by Contracting Officer's Representative from manufacturer's full range.

2.3 LAP SIDING

- E. Pattern: Boards 7.84 inches wide in plain style.
 - 1. Texture: Smooth.

2.4 PANEL SIDING

- F. Panel: 48-inch wide sheets.
 - 1. Texture: Smooth without grooves, square edges.
- G. Battens: Boards 2.70 inches wide.
 - 1. Texture: Smooth.

2.3 BOARD TRIM

- A. Boards of width indicated on Drawings.
 - 1. Texture: Smooth.

2.4 ACCESSORIES

- A. Flashing: Provide flashing complying with Section 07 62 00 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- B. Fasteners:
 - 1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of 1-inch into substrate.
 - 2. For fastening engineered wood, use hot-dip galvanized fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of treated engineered wood siding and related accessories.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
 - 1. Do not install damaged components.
 - 2. Fasten lap siding to each stud with 0.113" diameter by 2-1/2 inch nail at 8-inch on center maximum. Provide minimum 3/4 inch edge spacing and 1 inch overlap.
 - 3. Fasten panel siding to each stud with 0.113" diameter by 2-1/2 inch nail at 6-inch on center maximum. Provide minimum 3/4 inch edge spacing.
- B. Do not cut siding to fabricate trim; use trim components manufactured for the purpose.
- C. After installation, seal joints except lap joints of lap siding. Seal around penetrations. Paint exposed cut edges
- D. Install joint sealants as specified in Section 07 92 00 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 07 46 26

SECTION 07 62 00

SHEET METAL FLASHING AND TRIM

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. Formed roof-drainage sheet metal fabrications.
2. Formed steep-slope roof sheet metal fabrications.
3. Formed wall sheet metal fabrications.

B. Related Requirements:

1. Section 06 10 00 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 07 41 13.16 "Standing-Seam Metal Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
3. Section 07 25 00 "Weather Barrier" for opening weather barrier installations.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.
- C. Coordinate material supply and installation with Section 07 41 13.16 "Standing-Seam Metal Roofing".

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples for Initial Selection: For each type of sheet metal and accessory indicated with factory-applied finishes.

1.5 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Engage an experienced installer who has completed sheet metal flashing and trim work similar in material, design and extent to that indicated for this project and with successful in-service performance.
- C. Coordinate supply of materials in this Section with Section 07 41 13.16 "Standing-Seam Metal Roof Panels".

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver sheet metal flashing materials and fabrications undamaged. Protect sheet metal flashing and trim materials and fabrications during transportation and handling.
- B. Unload, store, and install sheet metal flashing materials and fabrications in a manner to prevent bending, warping, twisting, and surface damage.

- C. Do not store sheet metal flashing and trim materials in contact Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- D. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.8 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install roof edge flashings capable of resisting the following design pressure:
 - 1. Design Pressure: As required to resist 130 MPH wind.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat.
 - 2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 3. Color: Match roof panel color.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl- or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Carlisle Residential; a division of Carlisle Construction Materials.
 - b. GCP Applied Technologies Inc. (formerly Grace Construction Products).
 - c. Henry Company.
 - 2. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 - 3. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- B. Slip Sheet: Coordinate with Section 07 41 13.16 "Standing-Seam Metal Roofing".

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- D. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

2.5 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed 1/2 inch to form drip. Miter and seam corners.
- A. Expansion Provisions: Space movement joints at maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Provide 6-inch wide concealed back plates at copings. Fabricate door and window flashings and reglets for bayonette-type lapping joints.
 - 1. Lapped or bayonet-type joints are permitted in concealed flashings and window and door head flashings.
 - 2. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 3. Use lapped expansion joints only where indicated on Drawings.
- B. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- C. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, but not less than one gage heavier thickness of metal being secured.
- D. Fabricate cleats, concealed back plates, and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than one gage heavier thickness of metal being secured.
- E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- F. Do not use graphite pencils to mark metal surfaces.

2.6 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- B. Valley Flashing: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- C. Drip Edges: Fabricate from the following materials:
 - 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- D. Eave, Rake, Ridge, and Hip Flashing: Fabricate from the following materials:

1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- E. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.
- F. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, and similar flashings to extend vertical legs 4 inches beyond wall openings. Form head and sill flashing with 2-inch-high, end dams. Fabricate from the following materials:
 1. Aluminum-Zinc Alloy-Coated Steel: 0.028 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Verify roofing terminations and base flashings are in place, sealed, and secured.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

- B. Apply slip sheet, wrinkle free, over underlayment before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Field cutting of metal panels by torch, reciprocating saw, or abrasive type cutting wheel is not permitted.
 - 2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
 - 3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
 - 6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection. Provide flashing joints lapped 6-inches with two rows of sealant in the joint.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 - 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant.

When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.

2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 "Joint Sealants."

3.4 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

3.5 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.
- C. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

3.6 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, and similar flashings to extend vertical legs 4 inches beyond wall openings.

3.7 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.8 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean off excess sealants.
- C. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 07 84 13

PENETRATION FIRESTOPPING

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. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in horizontal assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly. Obtain approval of authorities having jurisdiction prior to submittal.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping system when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping materials per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. Perform penetration firestopping system tests by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Test per testing standards referenced in "Penetration Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping systems shall bear classification marking of a qualified testing agency.
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek Group in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Penetration Firestopping Systems: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. 3M Fire Protection Products.
 - b. Hilti, Inc.
 - c. RectorSeal.
 - d. Specified Technologies, Inc.
- B. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. F-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated.
 - 2. T-Rating: At least one hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated.
 - 1. Permanent forming/damming/backing materials.
 - 2. Substrate primers.
 - 3. Collars.
 - 4. Steel sleeves.

2.3 FILL MATERIALS

- A. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

- B. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- C. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- D. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- E. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.

2.4 MIXING

- A. Penetration Firestopping Materials: For those products requiring mixing before application, comply with penetration firestopping system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing penetration firestopping systems, clean out openings immediately to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping materials.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping materials. Remove loose particles remaining from cleaning operation.
- B. Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION

- A. General: Install penetration firestopping systems to comply with manufacturer's written installation instructions and published drawings for products and applications.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.
- C. Install fill materials by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories and penetrating items to achieve required fire-resistance ratings.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 feet from end of wall and at intervals not exceeding 30 feet.
- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Designation of applicable testing and inspecting agency.
 - 3. Date of installation.
 - 4. Manufacturer's name.
 - 5. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Government will engage a qualified testing agency to perform tests and inspections according to ASTM E 2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping material and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's "Fire Resistance Directory" under product Category XHEZ.
- B. Penetration Firestopping Systems with No Penetrating Items:
 - 1. UL-Classified Systems: W-L- 0001-0999.
 - 2. F-Rating: 1 hour.
 - 3. T-Rating: 1 hour.
 - 4. L-Rating at Ambient: Less than 5.0 cfm/sq. ft..
 - 5. L-Rating at 400 Deg F: Less than 5.0 cfm/sq. ft..
 - 6. Type of Fill Materials: As required to achieve rating.
- C. Penetration Firestopping Systems for Metallic Pipes, Conduit, or Tubing:
 - 1. UL-Classified Systems: W-L- 1001-1999.
 - 2. F-Rating: 1 hour.
 - 3. T-Rating: 1 hour.
 - 4. L-Rating at Ambient: Less than 5.0 cfm/sq. ft..
 - 5. L-Rating at 400 Deg F: Less than 5.0 cfm/sq. ft..
 - 6. Type of Fill Materials: As required to achieve rating.

D. Penetration Firestopping Systems for Electrical Cables:

1. UL-Classified Systems: W-L- 3001-3999.
2. F-Rating: 1 hour.
3. T-Rating: 1 hour.
4. L-Rating at Ambient: Less than 5.0 cfm/sq. ft..
5. L-Rating at 400 Deg F: Less than 5.0 cfm/sq. ft..
6. Type of Fill Materials: As required to achieve rating.

E. Penetration Firestopping Systems for Insulated Pipes:

1. UL-Classified Systems: W-L- 5001-5999.
2. F-Rating: 1 hour.
3. T-Rating: 1 hour.
4. L-Rating at Ambient: Less than 5.0 cfm/sq. ft..
5. L-Rating at 400 Deg F: Less than 5.0 cfm/sq. ft..
6. Type of Fill Materials: As required to achieve rating.

END OF SECTION 07 84 13

SECTION 07 92 00

JOINT SEALANTS

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. Silicone joint sealants.
 - 2. Mildew-resistant joint sealants.
 - 3. Butyl joint sealants.

1.3 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Sustainable Design Submittals:
 - 1. Product Data: For sealants, indicating VOC content.
 - 2. Laboratory Test Reports: For sealants and primer, indicating compliance with requirements for low-emitting materials.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Installation Instructions: Indicate special procedures, surface preparations, and perimeter conditions requiring special attention.

- B. Product Test Reports: For each kind of joint sealant, for tests performed by a qualified testing agency.
- C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period indicated below:
 - 1. Warranty Period: 20 years from date of Substantial Completion for silicone sealants.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content: Sealants and sealant primers shall comply with the following:
 - 1. Architectural sealants shall have a VOC content of 250 g/L or less.
 - 2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
 - 3. Sealants and sealant primers for porous substrates shall have a VOC content of 775 g/L or less.
- C. Colors of Exposed Joint Sealants: As selected by Contracting Officer's Representative from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning; 791.
 - b. Pecora Corp.; 895.
 - c. Tremco, Inc.; Spectrum 2.
 - 2. Applications: Applications as follows:
 - a. Interior horizontal and vertical joints from metal to metal.
 - b. Wood to metal joints.

- c. Wood to gypsum board joints.
- d. Metal to gypsum board joints.

2.3 MILDEW-RESISTANT JOINT SEALANTS

- A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
- B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 25, Use NT.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Dow Corning; 786
 - b. Pecora Corp.; 898
 - c. Tremco, Inc.; Tremsil 200
 - 2. Applications: Applications as follows:
 - a. Plastic laminate to gypsum board joints.
 - b. Plumbing fixtures to wall joints.
 - c. Joints in plastic wall panels.

2.4 BUTYL JOINT SEALANTS

- A. Butyl-Rubber-Based Joint Sealants: ASTM C 1311.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bostik, Inc.; Chem-Calk 300
 - b. Pecora Corp.; BC-158
 - c. Tremco Incorporated; Tremco Butyl Sealant
 - 2. Applications: Wall applications as follows:
 - a. Exterior metal to metal joints.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Plastic laminate.
 - d. Plastic wall panels.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Do not use solvent curing sealants in enclosed, occupied spaces.
- C. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- D. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 1. Oversize backing 30 to 50 percent of joint width.
 2. Do not leave gaps between ends of sealant backings.
 3. Do not stretch, twist, puncture, or tear sealant backings.
 4. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 1. Place sealants so they directly contact and fully wet joint substrates.
 2. Completely fill recesses in each joint configuration.
 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

- G. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.
- B. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 07 92 00

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

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 hollow-metal work.
- B. Related Requirements:
 - 1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
 - 3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
 - 4. Locations of reinforcement and preparations for hardware.
 - 5. Details of each different wall opening condition.

6. Details of anchorages, joints, field splices, and connections.
 7. Details of accessories.
 8. Details of moldings, removable stops, and glazing.
- C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch-high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
1. Curries Company; ASSA ABLOY.
 2. Republic Doors and Frames.
 3. Steelcraft; an Allegion brand.
- B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

- A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
 - 1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

2.3 INTERIOR DOORS AND FRAMES

- A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2..
 - 1. Physical Performance: Level B according to SDI A250.4.
 - 2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
 - 1) Core at fire doors: Mineral board.
 - 3. Frames:
 - a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Knocked down.
 - 4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

- A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3..
 - 1. Physical Performance: Level A according to SDI A250.4.

2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Polystyrene.
 - f. Thermal-Rated (Insulated) Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 12.3 deg F x h x sq. ft./Btu (2.166 K x sq. m/W) when tested according to ASTM C 1363.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
 2. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

- F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- G. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
 - 2. Factory apply rated labels to fire rated door and frame units.
 - 3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 - 4. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.

- 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - b. Compression Type: Not less than two anchors in each frame.
 5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
 - E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
 - F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
 1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 3. Provide loose stops and moldings on inside of hollow-metal work.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
- 2.8 STEEL FINISHES
- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames for doors, transoms, sidelites, borrowed lites, and other openings, of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Install frames with removable stops located on secure side of opening.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - 2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
 - 3. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 - 4. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

- c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
 - 1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. At Bottom of Door: 5/8 inch plus or minus 1/32 inch.
 - c. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 - 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 - 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.
 - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Adjust doors for smooth and balanced door movement.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08 11 13

SECTION 08 31 13

ACCESS DOORS AND FRAMES

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 access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.2 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush Access Doors with Exposed Flanges:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Babcock-Davis.
 - b. JL Industries, Inc.; a division of the Activar Construction Products Group.
 - c. Karp Associates, Inc.
 - d. Larsens Manufacturing Company.
 - e. Milcor; Commercial Products Group of Hart & Cooley, Inc.

2. Description: Door face flush with frame, with a core of mineral-fiber insulation enclosed in sheet metal; with exposed flange, self-closing door, and concealed hinge.
3. Locations: Wall.
4. Door Size: As indicated on Drawings.
5. Fire-Resistance Rating: Not less than 1 hour.
6. Temperature-Rise Rating: 450 deg F at the end of 30 minutes.
7. Uncoated Steel Sheet for Door: Nominal 0.036 inch, 20 gage, factory primed.
8. Frame Material: Same material, thickness, and finish as door.
9. Latch and Lock: Self-latching door hardware, operated by knurled-knob with interior release.

2.3 MATERIALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.
- C. Frame Anchors: Same material as door face.

2.4 FABRICATION

- A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.
- B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish mounting holes, attachment devices and fasteners of type required to secure access doors to types of supports indicated.
- D. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

- C. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing access doors and frames.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 31 13

SECTION 08 52 00

WOOD WINDOWS

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 vinyl-clad wood windows.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review, discuss, and coordinate the interrelationship of wood windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
 - 3. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 4. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for wood windows.
- B. Shop Drawings: For wood windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Product Schedule: For wood windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of wood window, for tests performed by a qualified testing agency.
- B. Field quality-control reports.
- C. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: An installer acceptable to wood window manufacturer for installation of units required for this Project.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace wood windows that fail in materials or workmanship within specified warranty period. Warranty shall include materials and labor.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
 - 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 20 years from date of Substantial Completion.
 - c. Vinyl Cladding: Lifetime warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain wood windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: CW.
 - 2. Minimum Performance Grade: 60.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F. maximum.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.32.

2.3 WOOD WINDOWS

- A. Vinyl-Clad Wood Windows:
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Andersen Windows; Andersen Corporation.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Casement: Project out.
 - 2. Fixed.
- C. Frames and Sashes: Fine-grained wood lumber complying with AAMA/WDMA/CSA 101/I.S.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.
 - 1. Exterior Finish: Vinyl-clad wood.
 - a. Color: As selected by Contracting Officer's Representative from manufacturer's full range.
 - 2. Interior Finish: Unfinished.
 - a. Exposed Unfinished Wood Surfaces: Pine.
- D. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered where indicated on Drawings.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Sputtered on second surface.
- E. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Contracting Officer's Representative from manufacturer's full range.
- F. Projected Window Hardware:
1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Contracting Officer's Representative from manufacturer's full range of types and styles.
 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 29 inches tall and two arms on taller sashes.
 4. Operator Stud Cover: Matching operator handle finish. Provide in locations where operator handle is removed for controlled access.
 5. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches above floor.
- G. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- H. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
 - 1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
 - 1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 - 2. Finish for Interior Screens: Baked-on organic coating in color selected by Contracting Officer's Representative from manufacturer's full range.
 - 3. Finish for Exterior Screens: Baked-on organic coating in color selected by Contracting Officer's Representative from manufacturer's full range.
- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.
 - 1. Wire-Fabric Finish: Natural bright.

2.6 FABRICATION

- A. Fabricate wood windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze wood windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 52 00

SECTION 08 54 13
FIBERGLASS WINDOWS

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 fiberglass-framed windows.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for fiberglass windows.
- B. Shop Drawings: For fiberglass windows.
 - 1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches in size.
- D. Product Schedule: For fiberglass windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of fiberglass window, for tests performed by a qualified testing agency.
- B. Sample Warranties: For manufacturer's warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating fiberglass windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

- B. Installer Qualifications: An installer acceptable to fiberglass window manufacturer for installation of units required for this Project.

1.6 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that fail in materials or workmanship within specified warranty period.

- 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.
- 2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain fiberglass windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 - 1. Window Certification: WDMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 - 1. Minimum Performance Class: LC.
 - 2. Minimum Performance Grade: 40.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F.
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.30 0.27.

- E. Sound Transmission Class (STC): Rated for not less than 26 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- F. Outside-Inside Transmission Class (OITC): Rated for not less than 22 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

2.3 FIBERGLASS WINDOWS

- A. Basis-of-Design: Anderson Windows; A-Series.
- B. Operating Types: Provide the following operating types in locations indicated on Drawings:
 - 1. Casement: Project out.
 - 2. Fixed.
- C. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with AAMA 613 and AAMA 623.
 - 1. Exterior Color: As selected by Contracting Officer's Representative from manufacturer's full range.
 - 2. Interior Finish: Wood veneer clad, clear pine.
- D. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
 - 1. Kind: Fully tempered.
- E. Insulating-Glass Units: ASTM E 2190.
 - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered.
 - 2. Lites: Two.
 - 3. Filling: Fill space between glass lites with argon.
 - 4. Low-E Coating: Sputtered on second surface.
- F. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.
- G. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock fiberglass windows, and sized to accommodate sash weight and dimensions.
 - 1. Exposed Hardware Color and Finish: As selected by Contracting Officer's Representative from manufacturer's full range.

H. Projected Window Hardware:

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Contracting Officer's Representative from manufacturer's full range of types and styles.
 2. Hinges: Manufacturer's standard type for sash weight and size indicated.
 3. Single-Handle Locking System: Operates positive-acting arms that pull sash into locked position. Provide one arm on sashes up to 27-1/2 inches tall and two arms on taller sashes.
 4. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient length to operate window without reaching more than 60 inches above floor; one pole operator and pole hanger per room that has operable windows more than 72 inches above floor.
- I. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- J. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Jamb Extensions: Clear pine.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.
1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
 2. Finish for Interior Screens: Baked-on organic coating in color selected by Contracting Officer's Representative from manufacturer's full range.

- C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch-diameter, coated aluminum wire.

- 1. Wire-Fabric Finish: Natural bright.

2.6 FABRICATION

- A. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze fiberglass windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

- B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 08 54 13

SECTION 08 71 00
DOOR HARDWARE

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. Mechanical door hardware for the following:
 - a. Swinging doors.
- 2. Cylinders for door hardware specified in other Sections.

B. Related Requirements:

- 1. Section 08 11 13 "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
- 2. Section 08 71 13 "Automatic Door Operators" for low-energy power operators and low-energy power-assist operators.

C. Products furnished, but not installed, under this Section include the following. Coordinating, purchasing, delivering, and scheduling remain requirements of this Section.

- 1. Permanent cores to be installed by Contracting Officer's Representative.

1.3 COORDINATION

- A. Installation Templates: Distribute for doors, frames, and other work specified to be factory 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.
- B. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of Installer. Coordinate door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate the fabrication of other work that is critical in Project construction schedule.
2. Format: Use same scheduling sequence and format and use same door numbers as in door hardware schedule in the Contract Documents.
3. Content: Include the following information:
 - a. Identification number, location, hand, fire rating, size, and material of each door and frame.
 - b. Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
 - c. Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
 - d. Door and frame sizes and materials.
 - e. Fastenings and other installation information.
 - f. Explanation of abbreviations, symbols, and designations contained in door hardware schedule.
 - g. Mounting locations for door hardware.
 - h. List of related door devices specified in other Sections for each door and frame.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For compliance with accessibility requirements, for tests performed by manufacturer and witnessed by a qualified testing agency, for door hardware on doors located in accessible routes.

B. Affidavit of Coordination: Letter signed by AHC stating they have reviewed the drawings and specifications and have coordinated the hardware for completeness, substrates, conditions and project. Submittals submitted without affidavit will be returned without review.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of door hardware to include in maintenance manuals.

- B. Schedules: Final door hardware schedule.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and of an Architectural Hardware Consultant who is available during the course of the Work to consult Contractor, Architect, and Contracting Officer's Representative about door hardware and keying.
 - 1. Warehousing Facilities: Within 4-hour service call range of Project's vicinity.
 - 2. Scheduling Responsibility: Preparation of door hardware and keying schedule.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including excessive deflection, cracking, or breakage.
 - b. Faulty operation of doors and door hardware.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
 - 2. Warranty Period: Three years from date of Substantial Completion unless otherwise indicated below:
 - a. Exit Devices: Two years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of door hardware from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Where fire-rated doors are indicated, provide door hardware complying with NFPA 80 that is listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.
- B. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that complies with requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
 - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.
- C. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- D. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the DOJ's "2010 ADA Standards for Accessible Design" and the ABA standards of the Federal agency having jurisdiction.
 - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
 - 2. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
 - b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
 - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
 - 4. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.

2.3 SCHEDULED DOOR HARDWARE

- A. Provide products for each door that comply with requirements indicated in Part 2 and door hardware schedule.
 - 1. Door hardware is scheduled in Part 3.

2.4 HINGES

- A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Lawrence Hardware Inc.
 - d. McKinney Products Company; an ASSA ABLOY Group company.
- B. Hinge Weight: Unless otherwise indicated, provide the following:
 - 1. Entrance Doors: Heavy-weight hinges.
 - 2. Doors with Closers: Antifriction-bearing hinges.
 - 3. Interior Doors: Standard-weight hinges.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: As indicated in door hardware schedule.
- B. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
 - 1. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 - 2. Deadbolts: Minimum 1-inch bolt throw.
- C. Lock Backset: 2-3/4 inches unless otherwise indicated.
- D. Lock Trim:
 - 1. Description: Schlage L Series or approved substitution
 - 2. Levers: Cast.
 - a. Schlage Rhodes or approved substitution.
 - 3. Escutcheons (Roses): Forged.
 - 4. Dummy Trim: Match lever lock trim and escutcheons.
- E. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.
 - 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

- F. Mortise Locks: BHMA A156.13; Operational Grade 1; stamped steel case with steel or brass parts; Series 1000.

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allegion plc.
 - b. Best Access Systems; Stanley Security Solutions, Inc.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.

2.6 AUXILIARY LOCKS

- A. Bored Auxiliary Locks: BHMA A156.36: Grade 1; with strike that suits frame.

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allegion plc.
 - b. Best Access Systems; Stanley Security Solutions, Inc.
 - c. Hager Companies.
 - d. SARGENT Manufacturing Company; ASSA ABLOY.

2.7 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.

- 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. SARGENT Manufacturing Company; ASSA ABLOY.
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.

2.8 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Best Access Systems; Stanley Security Solutions, Inc., no substitutions. Match BEST E Keyway, 7-pin tumbler.

- B. Standard Lock Cylinders: BHMA A156.5; Grade 1 permanent cores; face finished to match lockset.
 - 1. Core Type: Interchangeable.
 - 2. Reuse existing to the extent possible.
- C. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
- D. Furnish permanent cores to Contracting Officer's Representative for keying and installation.

2.9 OPERATING TRIM

- A. Operating Trim: BHMA A156.6; bronze unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.10 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written instructions for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Norton Door Controls; an ASSA ABLOY Group company.
 - d. Stanley Commercial Hardware; a division of Stanley Security Solutions.
 - 2. Construction: Metallic piston bodies and cold weather fluid.
 - 3. Provide special templates, drop plates, and other offset arms required to coordinate with other hardware.

2.11 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.12 OVERHEAD STOPS AND HOLDERS

A. Overhead Stops and Holders: BHMA A156.8.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

2.13 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises, Inc.
 - e. Sealeze.

B. Maximum Air Leakage: When tested according to ASTM E 283 with tested pressure differential of 0.3-inch wg, as follows:

1. Smoke-Rated Gasketing: 0.3 cfm/sq. ft. of door opening.
2. Gasketing on Single Doors: 0.3 cfm/sq. ft. of door opening.
3. Gasketing on Double Doors: 0.50 cfm per foot of door opening.

- C. Smoke-Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke-control ratings indicated, based on testing according to UL 1784.
 - 1. Provide smoke-labeled gasketing on 20-minute-rated doors and on smoke-labeled doors.
- D. Fire-Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
 - 1. Test Pressure: After 5 minutes into the test, neutral pressure level in furnace shall be established at 40 inches or less above the sill.
- E. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated, based on testing according to ASTM E 1408.

2.14 THRESHOLDS

- A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Hager Companies.
 - b. National Guard Products, Inc.
 - c. Pemko Manufacturing Co.
 - d. Reese Enterprises, Inc.
 - e. Sealeze.

2.15 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch- thick bronze; with manufacturer's standard machine or self-tapping screw fasteners.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

2.16 AUXILIARY DOOR HARDWARE

A. Auxiliary Hardware: BHMA A156.16.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Allegion plc.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company; an ASSA ABLOY Group company.

B. Key Storage Box: Single key storage box for emergency fire department access, surface mounted. Knox Box #3208 as required by Seward Fire Department.

2.17 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:

a. Wood or Machine Screws: For the following:

- 1) Hinges mortised to doors.
- 2) Closers to doors.

b. Steel Through Bolts: For the following unless door blocking is provided:

- 1) Surface hinges to doors.

- 2) Closers to doors and frames.
 - 3) Surface-mounted exit devices.
3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
 4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.18 FINISHES

- A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. BHMA Designations: Comply with base material and finish requirements indicated by the following:
 1. BHMA 612: Satin bronze, clear coated, over bronze base metal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. 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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: For surface-applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

3.3 INSTALLATION

- A. Mounting Heights: 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.

- B. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Hinges: Install types and in quantities indicated in door hardware schedule, but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- D. Lock Cylinders: Install construction cores to secure building and areas during construction period.
 - 1. Furnish permanent cores to Contracting Officer's Representative for installation.
- E. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 07 92 00 "Joint Sealants."
- F. 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 will impede traffic.
- G. Overhead Stops: Install on push side of door unless noted otherwise.
- H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
 - 1. Do not notch perimeter gasketing to install other surface-applied hardware.
- I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
 - 1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.

- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.6 DOOR HARDWARE SCHEDULE

Items marked * are reuse existing.

Door Hardware Set No. 01

Door No. 101A; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	EXIT DEVICE	VD	9875L	612
1 EA.	CYLINDER*			
1 EA.	AUTO OPERATOR	STH	MAGIC ACCESS	628
1 EA.	KICK PLATE*			
1 SET	GASKET	PE	S88	BROWN
1 EA.	WALL STOP	RM	401	612
1 EA.	THRESHOLD*			
1 EA.	AUTO. DOOR BOTTOM	PE	4131CPKL	628

Door Hardware Set No. 02

Door No. 101B; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	EXIT DEVICE*			
1 EA.	CYLINDER*			
1 EA.	AUTO OPERATOR	STH	MAGIC ACCESS	628
1 EA.	KICK PLATE*			
1 SET	GASKET	PE	S88	BROWN
1 EA.	WALL STOP	RM	401	612
1 EA.	THRESHOLD*			
1 EA.	AUTO. DOOR BOTTOM	PE	4131CPKL	628

Door Hardware Set No. 03

Door No. 102; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	LOCKSET*		CLASSROOM	612
1 EA.	KICKPLATE*			612
1 EA.	WALL STOP	RM	401	612
1 SET	GASKET*			

Door Hardware Set No. 04

Door No. 103, 104, 209; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	LOCKSET	SCH	L9040	612
1 EA.	KICKPLATE*			612
1 EA.	WALL STOP	RM	401	612
3 EA.	SILENCER*			
1 EA.	L9040 IS AVAILABLE FOR REUSE			

Door Hardware Set No. 05

Door No. 105, 106; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	LOCKSET*		OFFICE	612
3 EA.	SILENCER*			

Door Hardware Set No. 06

Door No. 107A; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB168	633
1 EA.	LOCKSET*		CLASSROOM	612
1 EA.	CLOSER	LCN	4011	STAT
1 EA.	WALL STOP	RM	401	612
1 EA.	KICK PLATE*			612
1 SET	GASKET	PE	S88	BROWN

Door Hardware Set No. 07

Door No. 107B; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB199	612
1 EA.	EXIT DEVICE	VD	9875L	612
1 EA.	CYLINDER	BES		612
1 EA.	KICK PLATE	RM	K1125	612
1 SET	GASKET	PE	S88	BROWN
1 EA.	WALL STOP	RM	401	612
1 EA.	THRESHOLD	PE	273X3AFG	719
1 EA.	AUTO. DOOR BOTTOM	PE	4131CPKL	628

Door Hardware Set No. 08

Door No. 108; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB168	633
1 EA.	LOCKSET*		OFFICE	612
1 EA.	CLOSER*			
1 EA.	KICKPLATE*			612
1 EA.	WALL STOP	RM	401	612
1 SET	GASKET	PE	S88	BROWN

Door Hardware Set No. 09

Door No. 109; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	EXIT DEVICE	VD	9875L	612
1 EA.	CYLINDER	BES		612
1 EA.	CLOSER*			
1 EA.	KICKPLATE*			612
1 EA.	WALL STOP/HOLDER	RM	494R	612
1 SET	GASKET	PE	S88	BROWN

Door Hardware Set No. 10

Door No. 110; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB199	612
1 EA.	LOCKSET*		STORAGE	612
1 EA.	CLOSER*			
1 EA.	KICKPLATE*			612
1 EA.	WALL STOP	RM	401	612
1 SET	GASKET	PE	S88	BROWN
1 EA.	THRESHOLD	PE	252X226AFGT	719

Door Hardware Set No. 11

Door No. 111; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	LOCKSET*		OFFICE	612
1 EA.	WALL STOP	RM	401	612
1 EA.	KICKPLATE*			612
3 EA.	SILENCER*			

Door Hardware Set No. 12

Door No. 112; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE*			612
1 EA.	LOCKSET*		OFFICE	612
1 EA.	WALL STOP	RM	401	612
1 EA.	KICKPLATE*			612
3 EA.	SILENCER*			

Door Hardware Set No. 13

Door No. 113A; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB199	612
1 EA.	LOCKSET	SCH	L9080	612
1 EA.	CLOSER	LCN	4011CUSH	STAT
1 EA.	KICK PLATE*			612
1 SET	GASKET	PE	S88	BROWN
1 EA.	THRESHOLD	PE	273X3AFG	719
1 EA.	SWEEP	PE	18100CNB	628
1 EA.	DOOR DRIP	PE	345	628

Door Hardware Set No. 14

Door No. 113B; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB191	633
1 EA.	LOCKSET*		OFFICE	612
1 EA.	CLOSER*			
1 SET.	GASKET	PS	S88	BROWN
1 EA.	WALL STOP	RM	401	612

Door Hardware Set No. 15

Door No. 210; each to have the following:

No.	Item	Manufacturer	Description	Finish
3 EA.	HINGE	STH	FBB168	633
1 EA.	LOCKSET*		ENTRY	612
1 EA.	CLOSER*			
1 EA.	KICKPLATE*			612
1 EA.	MAG. HOLDER	LCN	7850	ALUM
1 SET	GASKET	PE	S88	BROWN

END OF SECTION 08 71 00

SECTION 08 71 13
AUTOMATIC DOOR OPERATORS

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. Low-energy door operators for swinging doors.

- B. Related Requirements:

- 1. Section 08 71 00 "Door Hardware" for additional related hardware scheduled for the opening.

1.3 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- D. For automatic door terminology, see BHMA A156.10 and BHMA A156.19 for definitions of terms.

1.4 COORDINATION

- A. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing automatic door operators.
- B. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for automatic door operators.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For automatic door operators.

1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Indicate locations of activation and safety devices.
4. Include diagrams for power, signal, and control wiring.
5. Include plans, elevations, sections, and attachment details for guide rails.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of automatic door operator.

C. Field quality-control reports.

D. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For automatic door operators, safety devices, and control systems, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project.

1.9 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of automatic door operators that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Faulty or sporadic operation of automatic door operator, including controls.

- b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
- 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Besam Entrance Solutions; ASSA ABLOY.
 - 2. Horton Automatics; a division of Overhead Door Corporation.
 - 3. record-usa.
 - 4. Stanley Access
- B. Source Limitations: Obtain automatic door operators, including activation and safety devices, from single source from single manufacturer.

2.2 AUTOMATIC DOOR OPERATORS, GENERAL

- A. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and according to UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
 - 1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to automatic door operator when door is in emergency breakaway position, to return door to closed position after breakaway, and to automatically reset.
 - 2. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of 130 mph.
- B. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation including spring closing when power is off.
- C. Hinges: See Section 08 71 00 "Door Hardware" for hinge type for each door that door operator shall accommodate.
- D. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch-thick, extruded or formed aluminum; continuous over full width of operator-controlled door opening; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.

- E. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- F. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.3 LOW-ENERGY DOOR OPERATORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
 - 1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
 - 2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration: Operator to control single swinging door.
 - 1. Traffic Pattern: Two way.
 - 2. Operator Mounting: Surface.
- D. Operation: Power opening and spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- E. Operating System: Electromechanical.
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 - 1. Adjustable opening and closing speed.
 - 2. Adjustable opening and closing force.
 - 3. Adjustable backcheck.
 - 4. Adjustable hold-open time from zero to 30 seconds.
 - 5. Adjustable acceleration.
 - 6. Obstruction recycle.
 - 7. On-off/hold-open switch to control electric power to operator.
- H. Activation Device: Push-plate switch on each side of door to activate door operator.
- I. Exposed Finish: Class I, clear anodic finish.

2.4 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
 - 1. Extrusions: ASTM B 221.
 - 2. Sheet: ASTM B 209.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness, in manufacturer's standard thickness.
- C. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.5 CONTROLS

- A. General: Provide controls, including activation and safety devices, according to BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed in plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.
- C. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- D. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator with contrasting-colored, engraved message.
 - 1. Configuration: Round push plate with 4-by-4-inch junction box.
 - a. Mounting: Surface mounted on wall.
 - 2. Push-Plate Material: Stainless steel as selected by Architect from manufacturer's full range.
 - 3. Message: International symbol of accessibility and "Push to Open."
- E. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.6 FABRICATION

- A. Factory fabricate automatic door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.

- C. Fabricate exterior components to drain condensation and water passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.
- E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.7 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
 - 1. Application Process: Operator manufacturer's standard process.
 - 2. Provide sign materials with instructions for field application when operators are installed.

2.8 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.9 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other conditions affecting performance of automatic door operators.
- B. Examine roughing-in for electrical systems to verify actual locations of power connections before automatic door operator installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install automatic door operators according to manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
 - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 - 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices according to manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring according to **Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."**
- C. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Test and inspect each automatic door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA standards.
- B. Automatic door operators will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust automatic door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust operators on exterior doors for weathertight closure.
- B. After completing installation of automatic door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- C. Readjust automatic door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Government's maintenance personnel to adjust, operate, and maintain automatic door operators.

END OF SECTION 08 71 13

SECTION 08 80 00

GLAZING

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. Glass for doors.
 - 2. Glazing sealants and accessories.
- B. Related Requirements:
 - 1. Section 08 52 00 "Wood Windows" for factory glazed window units.
 - 2. Section 08 54 13 "Fiberglass Windows" for factory glazed window units.

1.3 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - 1. Warranty Period: Five years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E 1300.
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Wind Design Data: As indicated on Drawings.
 - b. Basic Wind Speed: 130 mph.
 - c. Importance Factor: 1.0.
 - d. Exposure Category: D.

2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 3. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Safety Glazing: Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.

2.2 GLASS PRODUCTS, GENERAL

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.
1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
 2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
- C. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- D. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.
- E. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.3 GLASS PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

2.4 INSULATING GLASS

- A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
 - 1. Sealing System: Dual seal.
 - 2. Perimeter Spacer: Stainless steel or nonmetallic tube.
 - 3. Desiccant: Molecular sieve or silica gel, or a blend of both.
- B. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:
 - 1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

2.6 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

PART 3 - EXECUTION

3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches.
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.3 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

3.4 INSULATING GLASS SCHEDULE

A. Glass Type IS: Low-E-coated, clear insulating glass.

1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Sputtered on second surface.
7. Winter Nighttime U-Factor: 0.28 maximum.
8. Summer Daytime U-Factor: 0.28 maximum.
9. Visible Light Transmittance: 68 percent minimum.
10. Solar Heat Gain Coefficient: 0.39 maximum.
11. Safety glazing required.

END OF SECTION 08 80 00

SECTION 09 29 00

GYPSUM BOARD

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. Interior gypsum board.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Mark-up construction drawings to indicate proposed gypsum wallboard control joint locations.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
 - 1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products.", UL's "Fire Resistance Directory." GA-600, or "Fire Resistance Design Manual."

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.

2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.

- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 2. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 3. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 4. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 0.022 inch.
 - 2. Depth: 7/8 inch.
- C. Resilient Furring Channels: 1/2-inch deep, asymmetrical steel sheet members designed to reduce sound transmission.
- D. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch, minimum uncoated-metal thickness of 0.0179 inch, 2-inch deep.
- E. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
- F. Sound-Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.
 - 1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
- G. Acoustical Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- H. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."
- I. Acoustic Insulation: Unfaced glass-fiber blankets; ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

- J. Vapor Retarder: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ACOUSTICAL INSULATION INSTALLATION:

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- C. Install batt insulation friction fit between framing members. Secure in place to prevent sag.
- D. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.
- E. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with panel placement.
- F. Until gypsum board is installed, hold insulation in place with 10 inch staples fabricated from 0.065 inch diameter tie wire and inserted through slot in web of stud.

3.3 FURRING INSTALLATION

- A. Direct Furring:
 - 1. Screw to wood framing.
- B. Z-Shaped Furring Members:
 - 1. Securely attach narrow flanges of furring members to wall.
 - 2. At corners, lap furring members and screw webs together.

3.4 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch-wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.
- I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

3.5 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Wallboard Type: Vertical and horizontal surfaces indicated on Drawings.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.6 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Contracting Officer's Representative for visual effect.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners unless otherwise indicated.
 2. LC-Bead: Use at exposed panel edges.
 3. L-Bead: Use Where LC-Bead cannot be installed..

3.7 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 2. Level 2: Panels that are substrate for paneling.

3. Level 4: At panel surfaces that will be exposed to view.
 - a. Primer and its application to surfaces are specified in Section 09 90 00 "Painting."
 4. Level 5: Where indicated on Drawings.
 - a. Primer and its application to surfaces are specified in Section 09 90 00 "Painting."
- E. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Contracting Officer's Representative will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
1. Notify Contracting Officer's Representative seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 2. Before notifying Contracting Officer's Representative, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 50 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control-air tubing.
 - f. Installation of ceiling support framing.
 - g. Installation of electrical raceways.

3.8 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 51 13

ACOUSTICAL PANEL CEILINGS

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 exposed suspension systems for interior ceilings.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations: Obtain each type of acoustical suspension system from single source from single manufacturer.

2.2 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corporation.
 - 3. Chicago Metallic Corporation.
 - 4. United States Gypsum Company.

- B. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories according to ASTM C 635/C 635M and designated by type, structural classification, and finish indicated.
- C. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
 - 1. Structural Classification: Heavy-duty system.
 - 2. End Condition of Cross Runners: butt-edge type.
 - 3. Face Design: Flat, flush.
 - 4. Cap Material: Cold-rolled steel.
 - 5. Cap Finish: Painted black.

2.3 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 - 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: screw anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
 - 1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 - 2. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than 0.106-inch- diameter wire.

2.4 METAL EDGE MOLDINGS AND TRIM

- A. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - 1. Edge moldings shall fit suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - 2. Provide manufacturer's standard seismic clips to avoid 2-inch edge angle.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which grids attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of ceilings.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical grids to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width grids at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

- A. Install acoustical grid ceilings according to ASTM C 636/C 636M and manufacturer's written instructions.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 - 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 - 5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 - 6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 - 7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to wood deck.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area.
 - 1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 - 2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical grids, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

SECTION 09 65 13

RESILIENT BASE AND ACCESSORIES

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. Resilient base.
 - 2. Resilient stair accessories.
 - 3. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 2 inches long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type and color of product specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 100 deg F, in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Install resilient products after other finishing operations, including painting, have been completed.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace resilient base and accessories that do not comply with requirements or that fail in materials within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; a Tarkett company.
 - 5. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TP (rubber, thermoplastic).
 - 1. Group: I (solid, homogeneous).
 - 2. Style and Location:

- a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
- C. Thickness: 0.125 inch.
- D. Height: 4 inches.
- E. Lengths: Coils in manufacturer's standard length.
- F. Colors: As selected by Contracting Officer's Representative from full range of industry colors.

2.2 SLIP RESISTANT RESILIENT VINYL STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Johnsonite; a Tarkett company.
 - 4. Roppe Corporation, USA.
- C. Stair Treads: ASTM F 2169, Type TV (vinyl, thermoplastic).
 - 1. Class: 1 (smooth, flat).
 - 2. Group: 1 (embedded abrasive strips).
 - 3. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 - 4. Nosing Height: 1-1/2 inches.
 - 5. Thickness: 1/4 inch and tapered to back edge.
 - 6. Size: Lengths and depths to fit each stair tread in one piece.
- D. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
 - 1. Style: Coved toe, 7 inches high by length matching treads.
 - 2. Thickness: 0.125 inch.
- E. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- F. Locations: Provide vinyl stair accessories in areas indicated.
- G. Colors and Patterns: As selected by Contracting Officer's Representative from full range of industry colors.

2.3 VINYL MOLDING ACCESSORY

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Burke Mercer Flooring Products; a division of Burke Industries Inc.
 - 3. Flexco.
 - 4. Johnsonite; a Tarkett company.
 - 5. Roppe Corporation, USA.
- B. Description: Vinyl transition strips.
- C. Profile and Dimensions: As indicated below.
 - 1. Carpet to Resilient Flooring; Roppe 177.
 - 2. Resilient Flooring to Concrete; Roppe 172.
- D. Colors and Patterns: As selected by Contracting Officer's Representative from full range of industry colors.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.

F. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Form without producing discoloration (whitening) at bends. Shave back of base vertically at fold point and at two diagonal additional stress relief gouges on the vertical surface, approximately 1/2-inch long, 1-inch from the center gouge.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
 - a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
 2. Tightly adhere to substrates throughout length of each piece.
 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
 1. Apply two coat(s).

- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16
RESILIENT SHEET FLOORING

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 vinyl sheet flooring.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 1. Show details of special patterns.
- C. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than 6-by-9-inch sections.
 - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than 9 inches long, of each color required.
- D. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient sheet flooring product, color, and pattern required; with seam running lengthwise and in center of 6-by-9-inch Sample applied to a rigid backing and prepared by Installer for this Project.
- E. Product Schedule: For resilient sheet flooring. Use same designations indicated on Drawings.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For each type of resilient sheet flooring to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming method indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient sheet flooring and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive resilient sheet flooring during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
- C. Close spaces to traffic during resilient sheet flooring installation.
- D. Close spaces to traffic for 48 hours after resilient sheet flooring installation.
- E. Install resilient sheet flooring after other finishing operations, including painting, have been completed.

1.8 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace resilient flooring that do not comply with requirements or that fail in materials within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Johnsonite; a Tarkett company.
 - 3. Mannington Mills, Inc.
- C. Product Standard: ASTM F 1913.
- D. Thickness: 0.080 inch.
- E. Wearing Surface: Smooth.
- F. Sheet Width: As standard with manufacturer.
- G. Seamless-Installation Method: Heat welded.
- H. Colors and Patterns: As selected by Contracting Officer's Representative from full range of industry colors.

2.2 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
- C. Seamless-Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Color: Match flooring.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch radius provided or approved by resilient sheet flooring manufacturer.

2. Cap Strip: Square metal, vinyl, or rubber cap provided or approved by resilient sheet flooring manufacturer.
 3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient sheet flooring until it is the same temperature as the space where it is to be installed.
1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 RESILIENT SHEET FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient sheet flooring.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
1. Maintain uniformity of flooring direction.

2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.
 3. Double cut seams.
 4. Match edges of flooring for color shading at seams.
 5. Avoid cross seams.
 6. Layout seams to avoid less than 1/3 of full roll width.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, and door frames.
 - E. At movable and demountable partitions, install flooring under partitions without interruption in flooring or pattern.
 - F. Center seams and transitions under doors.
 - G. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
 - H. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
 - I. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
 - J. Seamless Installation:
 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 - K. Integral-Flash-Cove Base: Cove resilient sheet flooring 4 inches up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
 1. Install metal corners at inside and outside corners.
- 3.4 CLEANING AND PROTECTION
- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
 - B. Perform the following operations immediately after completing resilient sheet flooring installation:
 1. Remove adhesive and other blemishes from surfaces.
 2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.

- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 68 13

TILE CARPETING

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 modular carpet tile.
- B. Related Requirements:
 - 1. Section 02 41 19 "Selective Demolition" for removing existing floor coverings.
 - 2. Section 09 65 13 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 DEFINITIONS

- A. Pile Thickness: Yarn Tuft heights above top surface of backing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include manufacturer's written installation recommendations for each type of substrate.
- B. Sustainable Design Submittals:
 - 1. Laboratory Test Reports: For flooring products, indicating compliance with requirements for testing and product requirements of CRI's "Green Label Plus" testing program.
 - 2. Laboratory Test Reports: For flooring products, indicating compliance with requirements for low-emitting materials.
- C. Shop Drawings: For carpet tile installation, plans showing the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.

3. Type of subfloor.
 4. Type of installation.
 5. Pattern of installation.
 6. Pattern type, location, and direction.
 7. Pile direction.
 8. Type, color, and location of insets and borders.
 9. Type, color, and location of edge, transition, and other accessory strips.
 10. Transition details to other flooring materials.
- D. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
1. Carpet Tile: Full-size Sample.
 2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch-long Samples.
- E. Product Schedule: For carpet tile. Use same designations indicated on Drawings.
- F. Sustainable Product Certification: Provide ANSI/NSF 140 certification for carpet products.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.
- B. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI's "CRI Carpet Installation Standard."

1.10 FIELD CONDITIONS

- A. Comply with CRI's "CRI Carpet Installation Standard" for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, the following:
 - a. More than 10 percent edge raveling, snags, and runs.
 - b. Dimensional instability.
 - c. Excess static discharge.
 - d. Loss of tuft-bind strength.
 - e. Loss of face fiber.
 - f. Delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 - 1. Basis-of-Design Product: The design for each carpet type is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.
 - a. Substitutions will be evaluated on overall performance, yarn performance, warranty, yarn colors, and size of pattern.

2.2 CARPET TILE (CPT-1)

- A. Basis-of-Design: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Interface, LLC., Platform, Colorline.
- B. Color: 9336 - Stratosphere.
- C. Fiber Content: 100 percent nylon 6,6.
- D. Recycled Content: 52 percent.
- E. Pile Characteristic: Tufted textured loop.
- A. Density: 4,754 oz./cu. yd. minimum based on pile thickness.
- B. Pile Thickness: 0.106 for finished carpet tile according to ASTM D 6859.
- C. Surface Pile Weight: 14 oz./sq. yd..
- D. Backing System: GlasBac.
- E. Size: 19.69 by 19.69 inches.
- F. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
- G. Sustainable Design Requirements:
 - 1. Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
 - 2. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- H. Performance Characteristics:
 - 1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
 - 2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
 - 3. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.3 CARPET TILE (CPT-2)

- A. Basis-of-Design: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Interface, LLC., Menagerie.
- B. Color: 4941 – Cornflower.
- C. Fiber Content: 100 percent nylon 6.
- D. Recycled Content: 59 percent post-industrial, 5 percent post-consumer.
- E. Fiber Type: Aquafil.
- F. Pile Characteristic: Tufted-Tip Sheared pile.
- G. Density: 6,832 oz./cu. yd. minimum based on pile thickness.
- H. Pile Thickness: 0.137 for finished carpet tile according to ASTM D 6859.
- I. Stitches: 10 stitches per inch.
- J. Gage: 12 ends per inch.
- K. Surface Pile Weight: 26 oz./sq. yd..
- L. Backing System: GlasBac.
- M. Size: 19.69 by 19.69 inches.
- N. Applied Treatments:
 - 1. Soil-Resistance Treatment: Manufacturer's standard treatment.
 - 2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
- O. Sustainable Design Requirements:
 - 1. Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
 - 2. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

P. Performance Characteristics:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.4 CARPET TILE (CPT-3)

A. Basis-of-Design: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. Interface, LLC., Sidetrack.

B. Color: 104257 – Stratosphere/Track.

C. Fiber Content: 100 percent nylon 6,6.

D. Recycled Content: 52 percent.

E. Pile Characteristic: Tufted textured loop.

F. Density: 5,294 oz./cu. yd. minimum based on pile thickness.

G. Pile Thickness: 0.102 for finished carpet tile according to ASTM D 6859.

H. Surface Pile Weight: 15 oz./sq. yd..

I. Backing System: GlasBac.

J. Size: 19.69 by 19.69 inches.

K. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.
2. Antimicrobial Treatment: Manufacturer's standard treatment that protects carpet tiles as follows:
 - a. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.

L. Sustainable Design Requirements:

1. Carpet and cushion shall comply with testing and product requirements of CRI's "Green Label Plus" testing program.
2. Flooring products shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

M. Performance Characteristics:

1. Appearance Retention Rating: Severe traffic, 3.5 minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm according to NFPA 253.
3. Electrostatic Propensity: Less than 3.5 kV according to AATCC 134.

2.5 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.
- B. Examine carpet tile for type, color, pattern, and potential defects.
- C. Wood Subfloors: Verify the following:
 1. Underlayment over subfloor complies with requirements specified in Section 06 16 00 "Sheathing."
 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI's "Carpet Installation Standards" and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider, and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI's "CRI Carpet Installation Standard," Section 18, "Modular Carpet" and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: Partial glue down; install periodic tiles with releasable, pressure-sensitive adhesive.
- C. Maintain dye-lot integrity. Do not mix dye lots in same area.
- D. Maintain pile-direction patterns indicated on Drawings.
- E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI's "Carpet Installation Standard," Section 20, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 72 00
WALL COVERINGS

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. Textile wall covering.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include data on physical characteristics, durability, fade resistance, and fire-test-response characteristics.
- B. Samples for Verification: For each type of wall covering and for each color, pattern, texture, and finish specified, 6 by 8 inch minimum in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each wall covering, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wall coverings to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Wall-Covering Materials: For each type, color, texture, and finish, full width not less than four feet long.

1.7 FIELD CONDITIONS

- A. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by wall-covering manufacturer for full drying or curing.

1.8 WARRANTY

- A. Special Warranty: Installer agree to repair or replace fabric that fail in performance, materials, or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Fabric sagging, distorting, or releasing from panel edge.
 - 2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Low-Emitting Materials: Wall-covering system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services) "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- B. Fire-Test-Response Characteristics: As determined by testing identical wall coverings applied with identical adhesives to substrates according to test method indicated below by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.

2.2 TEXTILE WALL COVERING (ACOUSTIC WALL COVERING CPT-4)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Silence by tri|kes or comparable product by one of the following:
 - 1. Crosspoint Fabrics; a division of Shaw Industries.
 - 2. MDC Wallcoverings; Canyon.
- B. Description: Provide strippable wall coverings in rolls from same production run.
- C. Test Responses:
 - 1. Colorfastness to Wet and Dry Crocking: Passes AATCC 8, Grade 3, minimum.

2. Colorfastness to Light: Passes AATCC 16, Test Option 1 or 3, Grade 4, minimum, at 40 hours.
- D. Yarn Type: Blend of polyester and polypropylene
- E. Pile Thickness: 0.375 inch
- F. Total Weight: 30 oz./ly., excluding coatings.
- G. Width: 48 inches minimum.
- H. Applied Backing Material: Acrylic.
- I. Colors, Textures, and Patterns: As indicated on Drawings.

2.3 ACCESSORIES

- A. Adhesive: Mildew-resistant, nonstaining, strippable adhesive, for use with specific wall covering and substrate application indicated and as recommended in writing by wall-covering manufacturer.
 1. Adhesive shall have a VOC content of 50 g/L or less.
- B. Seam Tape: As recommended in writing by wall-covering manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for levelness, wall plumbness, maximum moisture content, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair bond of wall covering, including dirt, oil, grease, mold, mildew, and incompatible primers.
- C. Prepare substrates to achieve a smooth, dry, clean, structurally sound surface free of flaking, unsound coatings, cracks, and defects.
 1. Gypsum Board: Prime with primer as recommended in writing by primer/sealer manufacturer and wall-covering manufacturer.
 2. Painted Surfaces: Treat areas susceptible to pigment bleeding.

- D. Remove hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.
- E. Acclimatize wall-covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 WALL-COVERING INSTALLATION

- A. Comply with wall-covering manufacturers' written installation instructions applicable to products and applications indicated.
- B. Install wall covering with ribs vertically.
- C. Install wall covering without lifted or curling edges and without visible shrinkage.
- D. Install seams vertical and plumb at least 6 inches from outside corners and **6 inches** from inside corners. Horizontal seams are not permitted.
- E. Trim edges and seams for color uniformity, pattern match, and tight closure. Butt seams without overlaps or gaps between strips.
- F. Fully bond wall covering to substrate. Remove air bubbles, wrinkles, blisters, and other defects.

3.4 CLEANING

- A. Remove excess adhesive at seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended in writing by wall-covering manufacturer.
- C. Replace strips that cannot be cleaned.
- D. Reinstall hardware and hardware accessories, electrical plates and covers, light fixture trims, and similar items.

END OF SECTION 09 72 00

SECTION 09 90 00

PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and field painting of exposed interior items and scheduled exterior surfaces.
 - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Contracting Officer's Representative will select from standard colors and finishes available.
 - 1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish, except in mechanical equipment rooms, and electrical rooms.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, labels and exterior horizontal traffic surfaces.
 - 1. Prefinished items including, but not limited to, the following factory-finished components:
 - a. Architectural woodwork.
 - b. Elevator entrance doors and frames.
 - c. Elevator equipment.
 - d. Finished mechanical and electrical equipment.
 - e. Light fixtures.
 - 2. Concealed surfaces including, but not limited to, walls or ceilings in the following generally inaccessible spaces:
 - a. Foundation spaces.
 - b. Furred areas.
 - c. Ceiling plenums.

- d. Utility tunnels.
 - e. Pipe spaces.
 - f. Duct shafts.
 - g. Elevator shafts.
- 3. Finished metal surfaces including, but not limited to, the following:
 - a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.
 - d. Copper and copper alloys.
 - e. Bronze and brass.
- 4. Operating parts include, but not limited to, moving parts of operating equipment and the following:
 - a. Valve and damper operators.
 - b. Linkages.
 - c. Sensing devices.
 - d. Motor and fan shafts.
- 5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- 6. Exterior Horizontal Traffic Surfaces included, but are not limited to the following:
 - a. Sidewalks
 - b. Curbs not specifically scheduled for paint.
 - c. Asphalt concrete pavement.

1.3 DEFINITIONS

- A. General: Standard coating terms defined in ASTM D 16 apply to this Section.
 - 1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
 - 2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
 - 3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
 - 4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Sustainable Design Submittals:

1. Product Data: For paints and coatings, indicating VOC content.
2. Laboratory Test Reports: For paints and coatings, indicating compliance with requirements for low-emitting materials.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit 1 Samples on 8-by-10 inch cardstock for Contracting Officer's Representative review of color and texture only.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

1.6 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. PPG Industries, Inc. (Pittsburgh Paints).
 - 2. Rhodda Paint Co.
 - 3. Sherwin-Williams Co. (Sherwin-Williams).
- B. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT MATERIALS, GENERAL

- A. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- B. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
- C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

- D. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.
1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.
 2. Primers and Sealers: VOC content of not more than 200 g/L
 3. Nonflat Paints and Coatings: 150 g/L.
 4. Primers, Sealers, and Undercoaters: 200 g/L.
- E. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.
1. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 3.0 mils.
 2. Rodda; 508901 Metal Master 100% Acrylic Primer: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66W00310: Applied at a dry film thickness of not less than 2.0 mils.

2.3 INTERIOR PRIMERS

- A. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
1. Pittsburgh Paints; 6-2 SpeedHide Interior Quick-Drying Latex Sealer: Applied at a dry film thickness of not less than 1.0 mil.
 2. Rodda; 50701 Roseal Gypsum Primer: Applied at a dry film thickness of not less than 1.5 mils
 3. Sherwin-Williams; PrepRite 200 Latex Wall Primer B28W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Wood Primer for Acrylic-Enamel and Semigloss Alkyd-Enamel Finishes: Factory-formulated alkyd- or acrylic-latex-based interior wood primer.
1. Pittsburgh Paints; 17-921 Seal Grip 100 Percent Acrylic Universal Primer: Applied at a dry film thickness of not less than 1.6 mil.
 2. Rodda; Unique II 100% Acrylic Enamel Undercoater: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; Multi-Purpose Latex Primer B51W00020: Applied at a dry film thickness of not less than 1.6 mils.
- C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive alkyd-based metal primer.
1. Pittsburgh Paints; 90-712 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel: Applied at a dry film thickness of not less than 2.0 mils.

2. Rodda; 508901 Metal Master 100% Acrylic Primer: Applied at a dry film thickness of not less than 1.5 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66W00310: Applied at a dry film thickness of not less than 3.0 mils.

2.4 EXTERIOR FINISH COATS

- A. Exterior Semigloss Alkyd Enamel: Factory-formulated semigloss alkyd enamel for exterior application.
 1. Pittsburgh Paints; SpeedHide 6-Series Interior/Exterior WB Alkyd; Applied at a dry film thickness of not less than 1.5 mils.
 2. Rodda; 745001 Porsalite Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; SWP Exterior Oil Base Gloss A2 Series; Applied at a dry film thickness of not less than 4.0 mils.

2.5 INTERIOR FINISH COATS

- A. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.
 1. Pittsburgh Paints; 6-411 Series SpeedHide Eggshell Acrylic Latex Enamel: Applied at a dry film thickness of not less than 1.25 mils.
 2. Rodda; 533001 Lasyn Eggshell Finish Wall Paint: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; ProMar 200 Interior Latex Egg-Shell Enamel B20W200 Series: Applied at a dry film thickness of not less than 1.6 mils.
- B. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.
 1. Pittsburgh Paints; 6-500 Series SpeedHide Interior Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.0 mil.
 2. Rodda; 543101 Master Painter Int. Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.5 mils.
 3. Sherwin-Williams; ProMar 200 Latex Semi-Gloss, B31 Series: B31W200 Series: Applied at a dry film thickness of not less than 1.3 mils.

2.6 EXTERIOR WOOD-STAIN-SYSTEMS

- A. Wood Substrates: Exposed soffits.
 1. Solid-Color, Solvent-Based Stain System: Factory-formulated alkyd-based solid color wood stain for exterior application.
 - a. Olympic; 80301 Elite Solid Color Advances Stain.
 - b. Rodda Paint; 714401 Rural Manor II.
 - c. Pittsburgh Paints; 41-83XX Paramount Exterior Stain Solid.

2.7 INTERIOR WOOD STAINS AND VARNISHES

- A. Interior Wood Stain: Factory-formulated low VOC penetrating wood stain for interior application applied at spreading rate recommended by manufacturer.
 - 1. Olympic; 44500 Premium Interior Oil Based Wood Stain.
 - 2. Rodda; Cloverdale 06680 WeatherOne Semi-Transparent 100% Acrylic Stain.
 - 3. Sherwin-Williams; Wood Classics 250 VOC Stain, A49-800 Series.
- B. Clear Sanding Sealer: Factory-formulated fast-drying alkyd-based clear wood sealer applied at spreading rate recommended by manufacturer.
 - 1. Glidden Professional Paints; 1916-0000 Wood Pride Interior Quick Dry Sanding Sealer.
 - 2. Rodda; 705100 Quick Dry Sanding Sealer (solvent based)
 - 3. Pittsburgh Paints; Olympic; 43884 Interior Oil Based Gloss Polyurethane.
 - 4. Sherwin-Williams; Minwax, Polycrylic Protective Finish Satin, 3333.
- C. Interior Waterborne Clear Satin Varnish: Factory-formulated clear satin acrylic-based polyurethane varnish applied at spreading rate recommended by manufacturer.
 - 1. Olympic; 42786 Premium Interior Water Based Polyurethane Clear.
 - 2. Rodda; Cloverdale 59314 Waterborne Alkyd Varnish Satin.
 - 3. Sherwin-Williams; Minwax, Polycrylic Protective Finish Satin, 3333.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Wood: 15 percent.
 - 2. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. General: Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
 - 1. Provide barrier coats over incompatible primers or remove and reprime.
- D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. General: Apply paint according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames with exterior paint.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- C. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- D. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed to view in occupied spaces:
 - a. Equipment, including panelboards and switch gear.

- b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Mechanical and electrical equipment that is indicated to have a factory-primed finish for field painting.
 - 2. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.
 - 3. Sand lightly between each succeeding enamel or varnish coat.
 - E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces, except in mechanical equipment rooms, and electrical rooms.
 - F. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
 - G. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
 - H. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.
 - 1. Provide satin finish for final coats.
 - I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.
- 3.4 CLEANING AND PROTECTION
- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
 - C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
 - D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINT SCHEDULE

- A. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces:
 - 1. Semi-Gloss Acrylic Enamel Finish: Two finish coat over a rust-inhibitive primer.
 - a. Primer: Exterior Ferrous-metal primer.
 - b. Finish Coats: Exterior semi-gloss acrylic enamel.
- B. Wood Substrates: Exposed soffit framing.
 - 1. Solid-Color, Solvent-Based Stain System:
 - a. Prime Coat: Stain, exterior, solvent based, solid hide, matching topcoat.
 - b. Topcoat: Stain, exterior, solvent based, solid hide.

3.6 INTERIOR PAINT SCHEDULE

- A. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:
 - 1. Low-Luster Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer.
 - b. Finish Coats: Interior low-luster acrylic enamel.
 - 2. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior gypsum board primer.
 - b. Finish Coats: Interior semigloss acrylic enamel.
 - c. Locations: Toilet Rooms, and Janitor Rooms.
- B. Wood and Hardboard: Provide the following paint finish systems over new and existing interior wood surfaces:
 - 1. Semigloss Acrylic-Enamel Finish: Two finish coats over a wood undercoater.
 - a. Primer: Interior wood primer for acrylic-enamel and semigloss alkyd-enamel finishes.
 - b. Finish Coats: Interior semigloss acrylic enamel.
- C. Ferrous Metal: Provide the following finish systems over ferrous metal:
 - 1. Semigloss Acrylic Enamel Finish: Two finish coats over a primer.
 - a. Primer: Interior ferrous-metal primer.
 - b. Finish Coats: Interior semi-gloss acrylic enamel.

3.7 INTERIOR STAIN AND NATURAL-FINISH WOODWORK SCHEDULE

A. Stained Woodwork: Provide the following stained finishes over new interior woodwork:

1. Waterborne Stain Satin-Varnish Finish: Two finish coats of waterborne clear satin varnish over a sealer coat and waterborne interior wood stain. Wipe wood filler before applying stain.
 - a. Stain Coat: Interior wood stain.
 - b. Finish Coats: Interior waterborne clear satin varnish.

END OF SECTION 09 90 00

SECTION 10 28 00

TOILET, BATH, AND LAUNDRY ACCESSORIES

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. Public-use washroom accessories.
 - 2. Custodial accessories.

1.3 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - 2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
 - 1. Identify accessories using designations indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranty.

1.6 WARRANTY

- A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, visible silver spoilage defects.
 - 2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.
- B. Toilet Tissue (Roll) Dispenser (TPD):
 - 1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-2888.
 - 2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
 - 3. Mounting: Surface mounted.
 - 4. Operation: Noncontrol delivery with theft-resistant spindle.
 - 5. Capacity: Designed for 4-1/2- or 5-inch- diameter tissue rolls.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- C. Combination Towel (Folded) Dispenser/Waste Receptacle (PTD/R):
 - 1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-3947.
 - 2. Description: Combination unit for dispensing C-fold or multifold towels, with removable waste receptacle.
 - 3. Mounting: Recessed.
 - a. Designed for nominal 4-inch wall depth.
 - 4. Minimum Towel-Dispenser Capacity: 600 C-fold or 800 multifold paper towels.
 - 5. Minimum Waste-Receptacle Capacity: 12 gal.
 - 6. Material and Finish: Stainless steel, No. 4 finish (satin).
 - 7. Liner: Reusable, vinyl waste-receptacle liner.
 - 8. Lockset: Tumbler type for unit.
- D. Liquid-Soap Dispenser (SD):
 - 1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-2112.
 - 2. Description: Designed for dispensing soap in liquid or lotion form.
 - 3. Mounting: Horizontally oriented, surface mounted.
 - 4. Adhesive: Two component epoxy type, waterproof.
 - 5. Capacity: 40 oz..
 - 6. Materials: Stainless steel body, push button valve, unbreakable plastic refill indicator window, lock, vandal resistant mounting kit.

7. Lockset: Tumbler type.
8. Refill Indicator: Window type.

E. Grab Bar (GB):

1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-6800.
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, 0.05 inch thick.
 - a. Finish: Smooth, No. 4 finish (satin).
4. Outside Diameter: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Receptacle (SNR):

1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-270.
2. Mounting: Surface mounted.
3. Door or Cover: Self-closing, disposal-opening cover and hinged face panel.
4. Receptacle: Removable.
5. Material and Finish: Stainless steel, No. 4 finish (satin).

G. Mirror Unit (MI):

1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-165.
2. Frame: Stainless-steel channel.
 - a. Corners: Mitered and mechanically interlocked.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
 - a. One-piece, galvanized-steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
 - b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: As indicated on Drawings.

H. Coat Hook:

1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-2116.
2. Description: Single-prong unit.
3. Material and Finish: Satin chrome-plated brass.

2.2 CUSTODIAL ACCESSORIES

- A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Mop and Broom Holder:

1. Basis-of-Design: Bobrick Washroom Equipment, Inc.; Model B-239.
 2. Description: Unit with shelf, hooks, holders, and shelf.
 3. Length: 34 inches.
 4. Hooks: Four.
 5. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
 6. Material and Finish: Stainless steel, No. 4 finish (satin).
- a. Shelf: Not less than nominal 0.05-inch-thick stainless steel.

2.3 MATERIALS

- A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.
- B. Brass: ASTM B 19, flat products; ASTM B 16/B 16M, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.
- D. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.
- E. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.
- F. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.4 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Contracting Officer's Representative's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.
- B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Remove temporary labels and protective coatings.
- C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

SECTION 12 36 61.16

SOLID SURFACING COUNTERTOPS

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. Solid surface material countertops.
2. Solid surface material backsplashes.
3. Solid surface material apron fronts.

B. Related Requirements:

1. Section 22 40 00 "Plumbing Fixtures" for sinks and plumbing fittings.

1.3 ACTION SUBMITTALS

A. Product Data: For countertop materials.

B. Sustainable Design Submittals:

1. Product Data: For adhesives, indicating VOC content.
2. Laboratory Test Reports: For adhesives, indicating compliance with requirements for low-emitting materials.
3. Product Data: For composite wood products, indicating that product contains no urea formaldehyde.
4. Laboratory Test Reports: For composite wood products, indicating compliance with requirements for low-emitting materials.

C. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

1. Show locations and details of joints.

D. Samples for Initial Selection: For each type of material exposed to view.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include Product Data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate countertops similar to that required for this Project, and whose products have a record of successful in-service performance.
- B. Installer Qualifications: Fabricator of countertops.

1.6 COORDINATION

- A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID SURFACE COUNTERTOP MATERIALS

- A. Solid Surface Material: Homogeneous-filled plastic resin complying with ICPA SS-1.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - a. Avonite Surfaces.
 - b. E. I. du Pont de Nemours and Company.
 - c. Formica Corporation.
 - d. LG Chemical, Ltd.
 - e. Swan Corporation (The).
 - 2. Type: Provide Standard type unless Special Purpose type is indicated.
 - 3. Colors and Patterns: As selected by Contracting Officer's Representative from manufacturer's full range.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- C. Composite Wood Products: Products shall be made without urea formaldehyde.
- D. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.2 COUNTERTOP FABRICATION

- A. Fabricate countertops according to solid surface material manufacturer's written instructions and to the AWI/AWMAC/WT's "Architectural Woodwork Standards."
 - 1. Grade: Custom.
- B. Configuration:
 - 1. Front: 3/4-inch bullnose.
 - 2. Backsplash: Straight, slightly eased at corner.
- C. Countertops: 1/2-inch-thick, solid surface material laminated to 3/4-inch-thick particleboard with.
- D. Backsplashes: 1/2-inch thick, solid surface material.
- E. Fabricate tops with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
 - 1. Fabricate with loose backsplashes for field assembly.
- F. Joints: Fabricate countertops without joints.
- G. Cutouts and Holes:
 - 1. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.3 INSTALLATION MATERIALS

- A. Ledgers and Blocking: Dimension lumber conforming to DOC PS 20.
- B. Adhesive: Product recommended by solid surface material manufacturer.
 - 1. Adhesives shall have a VOC content of 70 g/L or less.
 - 2. Adhesive shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Sealant for Countertops: Comply with applicable requirements in Section 07 92 00 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive solid surface material countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install countertops level to a tolerance of 1/8 inch in 8 feet, 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
- B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- C. Secure countertops to subtops with adhesive according to solid surface material manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
- D. Install backsplashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
- E. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
- F. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts to prevent damage while cutting. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
 - 1. Seal edges of cutouts in particleboard subtops by saturating with varnish.
- G. Apply sealant to gaps at walls; comply with Section 07 92 00 "Joint Sealants."

END OF SECTION 12 36 61.16

SECTION 12 48 13

ENTRANCE FLOOR MATS AND FRAMES

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. Resilient-tile entrance mats.
- B. Coordinate size and location of recesses in concrete to receive floor mats and frames.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for floor mats and frames.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For floor mats and frames to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 ENTRANCE FLOOR MATS AND FRAMES, GENERAL

- A. Accessibility Standard: Comply with applicable provisions in the DOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 Insert regulation.

2.2 RESILIENT-TILE ENTRANCE MATS

- A. Rubber-Tire Tiles: Units of edge-grain-laminated and chenille-buffed, rubber-tire wall cuts; bonded to sheet rubber or other durable flexible backing sheet to form 3/8- to 7/16-inch-thick, square tile.
 - 1. Colors, Textures, and Patterns: Standard Grey.
 - 2. Tile Size: 12 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and floor conditions for compliance with requirements for location, sizes, and other conditions affecting installation of floor mats and frames.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install surface-type units to comply with manufacturer's written instructions; coordinate with entrance locations and traffic patterns.

3.3 PROTECTION

- A. After completing frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 12 48 13

SECTION 14 24 00
HYDRAULIC ELEVATORS

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 hydraulic passenger elevators.
- B. Related Requirements:
 - 1. Section 03 30 00 "Cast-in-Place Concrete" for setting sleeves, inserts, and anchoring devices in concrete.
 - 2. Section 05 50 00 "Metal Fabrications" for the following:
 - a. Attachment plates and angle brackets for supporting guide-rail brackets.
 - b. Divider beams.
 - c. Hoist beams.
 - d. Structural-steel shapes for subsills.
 - e. Pit ladders.
 - f. Cants made from steel sheet in hoistways.
 - 3. Section 09 68 13 "Tile Carpeting" for finish flooring in elevator cars.
 - 4. Section 22 30 00 "Plumbing Equipment" for sump pumps, sumps, and sump covers in elevator pits.
 - 5. Section 28 31 00 "Fire Detection and Alarm" for smoke detectors in elevator lobbies to initiate emergency recall operation and heat detectors in shafts and machine rooms to disconnect power from elevator equipment before sprinkler activation and for connection to elevator controllers.

1.3 DEFINITIONS

- A. Definitions in ASME A17.1/CSA B44 apply to work of this Section.

1.4 ACTION SUBMITTALS

- A. Product Data: Include capacities, sizes, performances, operations, safety features, finishes, and similar information. Include product data for car enclosures; hoistway entrances; and operation, control, and signal systems.
- B. Shop Drawings:
 - 1. Include project specific plans, elevations, sections, and large-scale details indicating service at each landing, clearance and travel of car, machine room layout, coordination with building structure, relationships with other construction, including hoistway entrance details, guide rails and attachments, and maximum rail bracket spacing and locations of equipment.
 - 2. Include large-scale layout of car-control station.
 - 3. Indicate maximum dynamic and static loads imposed on building structure at points of support as well as maximum and average power demands.
- C. Samples for Initial Selection: For finishes involving color selection.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Seismic Qualification Certificates: For elevator equipment, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Certificates: Signed by elevator manufacturer, certifying that hoistway, pit, and machine room layout and dimensions, as shown on Drawings, and electrical service, as shown and specified, are adequate for elevator system being provided.
- D. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For elevators to include in emergency, operation, and maintenance manuals.
 - 1. Submit manufacturer's/installer's standard operation and maintenance manual, in accordance with ASME A17.1/CSA B44 including diagnostic and repair information available to manufacturer's and Installer's maintenance personnel.

- B. Inspection and Acceptance Certificates and Operating Permits: As required by authorities having jurisdiction for normal, unrestricted elevator use.
- C. Continuing Maintenance Proposal: Submit a continuing maintenance proposal from Installer to Contracting Officer's Representative, in the form of a standard one-year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Elevator manufacturer or an authorized representative who is trained and approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials, components and equipment in manufacturer's protective packaging. Store materials, components, and equipment off of ground, under cover, and in a dry location.
- B. Permits and Inspections: Provide licenses and permits and perform required inspections and tests.

1.9 COORDINATION

- A. Coordinate installation of sleeves, block outs, elevator equipment with integral anchors, and other items that are embedded in concrete or masonry for elevator equipment. Furnish templates, sleeves, elevator equipment with integral anchors, and installation instructions and deliver to Project site in time for installation.
- B. Coordinate locations and dimensions of other work specified in other Sections that relates to hydraulic elevators, including pit ladders; sumps and floor drains in pits; entrance subsills; electrical service; and electrical outlets, lights, and switches in hoistways, pits, and machine rooms.

1.10 WARRANTY

- A. Manufacturer's Special Warranty: Manufacturer agrees to repair, restore, or replace elevator work that fails in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, operation or control system failure, including excessive malfunctions; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.
 - 2. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HYDRAULIC ELEVATOR MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
 - 1. KONE Inc.
 - 2. Otis Elevator Co.
 - 3. Schindler Elevator Corp.
- B. Source Limitations: Obtain elevators from single manufacturer.
 - 1. Major elevator components, including pump-and-tank units, plunger-cylinder assemblies, controllers, signal fixtures, door operators, car frames, cars, and entrances, shall be manufactured by single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with ASME A17.1/CSA B44.
- B. Accessibility Requirements: Comply with Section 407 in the United States Access Board's ADA-ABA Accessibility Guidelines and with ICC A117.1.
- C. Seismic Performance: Elevator system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 and shall comply with elevator seismic requirements in ASME A17.1/CSA B44.
 - 1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified."
 - 2. Project Seismic Design Category: D.
 - 3. Elevator Component Importance Factor: 1.0.
 - 4. Design earthquake spectral response acceleration short period (Sds) for Project is 1.19.
 - 5. Provide earthquake equipment required by ASME A17.1/CSA B44.
 - 6. Provide seismic switch required by ASCE/SEI 7.

2.3 ELEVATORS

- A. Elevator System, General: Manufacturer's standard elevator systems. Unless otherwise indicated, manufacturers' standard components shall be used, as included in standard elevator systems and as required for complete system.
- B. Elevator Description:
 - 1. .
 - 2. Type: Holeless, beside-the-car, single-acting, dual cylinder.
 - 3. Rated Load: 2500 lb.
 - 4. Freight Loading Class for Service Elevators: Class A.

5. Rated Speed: 100 fpm.
6. Operation System: Single automatic operation.
7. Auxiliary Operations:
 - a. Battery-powered lowering.
 - b. Automatic dispatching of loaded car.
 - c. Nuisance call cancel.
 - d. Off-peak operation
 - e. Automatic operation of lights and ventilation fans.
8. Car Enclosures:
 - a. Inside Width: 77 inches from side wall to side wall.
 - b. Inside Depth: 51 inches from back wall to front wall (return panels).
 - c. Inside Height: 93 inches to underside of ceiling.
 - d. Front Walls (Return Panels): Satin stainless steel, No. 4 finish with integral car door frames.
 - e. Car Fixtures: Satin stainless steel, No. 4 finish.
 - f. Side and Rear Wall Panels: Plastic laminate.
 - g. Reveals: Satin stainless steel, No. 4 finish.
 - h. Door Faces (Interior): Satin stainless steel, No. 4 finish.
 - i. Door Sills: Nickel silver.
 - j. Ceiling: Satin stainless steel, No. 4 finish.
 - k. Handrails: 1/2 by 2 inches rectangular satin stainless steel, No. 4 finish, at sides and rear of car.
 - l. Floor prepared to receive carpet (specified in Section 09 68 13 "Tile Carpeting").
9. Hoistway Entrances:
 - a. Width: 42 inches.
 - b. Height: 84 inches.
 - c. Type: Single-speed center opening.
 - d. Frames: Satin stainless steel, No. 4 finish.
 - e. Doors: Satin stainless steel, No. 4 finish.
 - f. Sills: Nickel silver.
10. Hall Fixtures: Satin stainless steel, No. 4 finish.
11. Additional Requirements:
 - a. Provide inspection certificate in each car, mounted under acrylic cover with frame made from satin stainless steel, No. 4 finish.

2.4 SYSTEMS AND COMPONENTS

- A. Pump Units: Positive-displacement type with a maximum of 10 percent variation between no load and full load and with minimum pulsations.
 - 1. Pump shall be submersible type with submersible squirrel-cage induction motor, and shall be suspended inside oil tank from vibration isolation mounts or shall be tank-top-mounted type with fan-cooled, squirrel-cage induction motor, and shall be mounted on oil tank with vibration isolation mounts and enclosed in prime-painted steel enclosure lined with 1-inch-thick, glass-fiber insulation board.
 - 2. Motor shall have wye-delta or solid-state starting.
 - 3. Motor shall have variable-voltage, variable-frequency control.
- B. Hydraulic Silencers: System shall have hydraulic silencer containing pulsation-absorbing material in blowout-proof housing at pump unit.
- C. Piping: Size, type, and weight of piping as recommended by elevator manufacturer, with flexible connectors to minimize sound and vibration transmissions from power unit.
 - 1. Cylinder units shall be connected with dielectric couplings.
- D. Hydraulic Fluid: Elevator manufacturer's standard fire-resistant fluid with additives as needed to prevent oxidation of fluid, corrosion of cylinder and other components, and other adverse effects.
- E. Inserts: Furnish required concrete inserts and similar anchorage devices for installing guide rails, machinery, and other components of elevator work. Device installation is specified in another Section.
- F. Car Frame and Platform: Welded or bolted steel units.
- G. Guides: Roller guides. Provide guides at top and bottom of car frame.

2.5 OPERATION SYSTEMS

- A. General: Provide manufacturer's standard microprocessor operation system as required to provide type of operation indicated.
- B. Auxiliary Operations:
 - 1. Single-Car Battery-Powered Lowering: When power fails, car is lowered to the lowest floor, opens its doors, and shuts down. System includes rechargeable battery and automatic recharging system.
 - 2. Automatic Dispatching of Loaded Car: When car load exceeds 80 percent of rated capacity, doors start closing.
 - 3. Nuisance Call Cancel: When car calls exceed a preset number while car load is less than a predetermined weight, all car calls are canceled. Preset number of calls and predetermined weight can be adjusted.

4. Loaded-Car Bypass: When car load exceeds 80 percent of rated capacity, car responds only to car calls, not to hall calls.
 5. Automatic Operation of Lights and Fan: When elevator is stopped and unoccupied with doors closed, lighting, ventilation fan, and cab displays are de-energized after 5 minutes and are re-energized before car doors open.
- C. Security Features: Security features shall not affect emergency firefighters' service.
1. Car-to-Lobby Feature: Feature, activated by keyswitch at main lobby that causes car to return immediately to lobby and open doors for inspection. On deactivation by keyswitch, calls registered before keyswitch activation are completed and normal operation is resumed.

2.6 DOOR-REOPENING DEVICES

- A. Infrared Array: Provide door-reopening device with uniform array of 36 or more microprocessor-controlled, infrared light beams projecting across car entrance. Interruption of one or more light beams shall cause doors to stop and reopen.
- B. Nudging Feature: After car doors are prevented from closing for predetermined adjustable time, through activating door-reopening device, a loud buzzer shall sound and doors shall begin to close at reduced kinetic energy.

2.7 CAR ENCLOSURES

- A. General: Provide enameled- or powder-coated-steel car enclosures to receive removable wall panels, with removable car roof, access doors, power door operators, and ventilation.
 1. Provide standard railings complying with ASME A17.1/CSA B44 on car tops where required by ASME A17.1/CSA B44.
- B. Materials and Finishes: Manufacturer's standards, but not less than the following:
 1. Subfloor: Exterior, underlayment-grade plywood, not less than 5/8-inch nominal thickness.
 2. Floor Finish: Specified in Section 09 68 13 "Tile Carpeting".
 3. Stainless-Steel Wall Panels: Flush, formed-metal construction; fabricated from stainless-steel sheet.
 4. Plastic-Laminate Wall Panels: Plastic laminate adhesively applied to 1/2-inch fire-retardant-treated particleboard with plastic-laminate panel backing and manufacturer's standard protective edge trim. Panels have a flame-spread index of 25 or less, when tested according to ASTM E 84. Plastic-laminate color, texture, and pattern as selected by Contracting Officer's Representative from plastic-laminate manufacturer's full range.
 5. Fabricate car with recesses and cutouts for signal equipment.
 6. Fabricate car door frame integrally with front wall of car.
 7. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 8. Sight Guards: Provide sight guards on car doors.

9. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.
10. Metal Ceiling: Flush panels, with four low-voltage downlights in each panel. Align ceiling panel joints with joints between wall panels.
11. Light Fixture Efficiency: Not less than 35 lumens/W.
12. Ventilation Fan Efficiency: Not less than 3.0 cfm/W.

2.8 HOISTWAY ENTRANCES

- A. Hoistway Entrance Assemblies: Manufacturer's standard horizontal-sliding, door-and-frame hoistway entrances complete with track systems, hardware, sills, and accessories. Frame size and profile shall accommodate hoistway wall construction.
 1. Where gypsum board wall construction is indicated, frames shall be self-supporting with reinforced head sections.
- B. Fire-Rated Hoistway Entrance Assemblies: Door-and-frame assemblies shall comply with NFPA 80 and be listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction based on testing at as close-to-neutral pressure as possible according to NFPA 252 or UL 10B.
 1. Fire-Protection Rating: 1 hour with 30-minute temperature rise of 450 deg F.
- C. Materials and Fabrication: Manufacturer's standards, but not less than the following:
 1. Steel Subframes: Formed from cold- or hot-rolled steel sheet, with factory-applied enamel or powder-coat finish or rust-resistant primer. Fabricate to receive applied finish as indicated.
 2. Stainless-Steel Frames: Formed from stainless-steel sheet.
 3. Stainless-Steel Doors: Flush, hollow-metal construction; fabricated from stainless-steel sheet.
 4. Sight Guards: Provide sight guards on doors matching door edges.
 5. Sills: Extruded or machined metal, with grooved surface, 1/4 inch thick.

2.9 SIGNAL EQUIPMENT

- A. General: Provide hall-call and car-call buttons that light when activated and remain lit until call has been fulfilled. Provide vandal-resistant buttons and lighted elements illuminated with LEDs.
- B. Car-Control Stations: Provide manufacturer's standard recessed car-control stations. Mount in return panel adjacent to car door unless otherwise indicated.
 1. Mark buttons and switches for required use or function. Use both tactile symbols and Braille.
 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.

- C. Swing-Return Car-Control Stations: Provide car-control stations mounted on rear of hinged return panel adjacent to car door and with buttons, switches, controls, and indicator lights projecting through return panel but substantially flush with face of return panel.
 - 1. Mark buttons and switches for function. Use both tactile symbols and Braille.
 - 2. Provide "No Smoking" sign matching car-control station, either integral with car-control station or mounted adjacent to it, with text and graphics as required by authorities having jurisdiction.
- D. Emergency Communication System: Two-way voice communication system, with visible signal, which dials preprogrammed number of monitoring station and does not require handset use. System is contained in flush-mounted cabinet, with identification, instructions for use, and battery backup power supply.
- E. Car Position Indicator: Provide illuminated, digital-type car position indicator, located above car door or above car-control station. Also, provide audible signal to indicate to passengers that car is either stopping at or passing each of the floors served. Include travel direction arrows if not provided in car-control station.
- F. Hall Push-Button Stations: Provide one hall push-button station at each landing.
 - 1. Provide manufacturer's standard wall-mounted units.
 - 2. Equip units with buttons for calling elevator and for indicating applicable direction of travel.
- G. Hall Lanterns: Units with illuminated arrows; however, provide single arrow at terminal landings. Provide the following:
 - 1. Units mounted in both jambs of entrance frame.
- H. Hall Annunciator: With each hall lantern, provide audible signals indicating car arrival and direction of travel. Signals sound once for up and twice for down.
 - 1. At manufacturer's option, audible signals may be placed on cars.
- I. Emergency Pictorial Signs: Fabricate from materials matching hall push-button stations, with text and graphics as required by authorities having jurisdiction, indicating that in case of fire, elevators are out of service and exits should be used instead. Provide one sign at each hall push-button station unless otherwise indicated.

2.10 FINISH MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, commercial steel, Type B, exposed, matte finish.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, commercial steel, Type B, pickled.
- C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304.

- D. Stainless-Steel Bars: ASTM A 276, Type 304.
- E. Aluminum Extrusions: ASTM B 221, Alloy 6063.
- F. Nickel Silver Extrusions: ASTM B 151/B 151M, Alloy UNS No. C74500 or No. C77600.
- G. Plastic Laminate: High-pressure type complying with NEMA LD 3, Type HGS for flat applications and Type BKV for panel backing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elevator areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work. Verify critical dimensions and examine supporting structure and other conditions under which elevator work is to be installed.
- B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install cylinder plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor and braced at intervals as needed to maintain alignment. Anchor cylinder guides at spacing needed to maintain alignment and avoid overstressing guides.
- B. Welded Construction: Provide welded connections for installing elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS workmanship and welding operator qualification standards.
- C. Sound Isolation: Mount rotating and vibrating equipment on vibration-isolating mounts to minimize vibration transmission to structure and structure-borne noise due to elevator system.
- D. Install piping above the floor, where possible. Install underground piping in casing.
- E. Lubricate operating parts of systems as recommended by manufacturers.
- F. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with car. Where possible, delay installation of sills and frames until car is operable in shaft. Reduce clearances to minimum, safe, workable dimension at each landing.
- G. Leveling Tolerance: 1/4 inch, up or down, regardless of load and travel direction.

- H. Set sills flush with finished floor surface at landing.
- I. Locate hall signal equipment for elevators as follows unless otherwise indicated:
 - 1. Place hall lanterns either above or beside each hoistway entrance.
 - 2. Mount hall lanterns at a minimum of 72 inches above finished floor.

3.3 FIELD QUALITY CONTROL

- A. Acceptance Testing: On completion of elevator installation and before permitting elevator use (either temporary or permanent), perform acceptance tests as required and recommended by ASME A17.1/CSA B44 and by governing regulations and agencies.
- B. Advise Contracting Officer's Representative and authorities having jurisdiction in advance of dates and times that tests are to be performed on elevators.

3.4 PROTECTION

- A. Temporary Use: Comply with the following requirements for elevator used for construction purposes:
 - 1. Provide car with temporary enclosure, either within finished car or in place of finished car, to protect finishes from damage.
 - 2. Provide strippable protective film on entrance and car doors and frames.
 - 3. Provide padded wood bumpers on entrance door frames covering jambs and frame faces.
 - 4. Provide other protective coverings, barriers, devices, signs, and procedures as needed to protect elevator and elevator equipment.
 - 5. Do not load elevators beyond their rated weight capacity.
 - 6. Engage elevator Installer to provide full maintenance service. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleanup, and adjustment as necessary for proper elevator operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.
 - 7. Engage elevator Installer to restore damaged work, if any, so no evidence remains of correction. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Government's maintenance personnel to operate, adjust, and maintain elevator(s).
- B. Check operation of elevator with Government's personnel present before date of Substantial Completion and again not more than one month before end of warranty period. Determine that operation systems and devices are functioning properly.

3.6 MAINTENANCE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of elevator Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper elevator operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
1. Perform maintenance during normal working hours.
 2. Perform emergency callback service during normal working hours with response time of four hours or less.

END OF SECTION 14 24 00

SECTION 21 05 00

COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wet Pipe Sprinkler System.
- B. Dry Pipe Sprinkler System.
- C. Fire Department Connections.
- D. System Design, Materials, Installation, and Certification.
- E. System Supervision Alarms.

1.2 SCOPE DESCRIPTION

- A. Provide a complete wet and dry automatic fire sprinkler systems, hydraulically calculated to protect the entire facility, complete and in operating order. These fire protection systems shall be in compliance with the contract documents, applicable codes and standards, as well as the Authority having jurisdiction. Sprinklers shall be installed throughout the building, including outside roof canopies, attic areas, crawlspaces, and underfloor areas, utilizing systems compatible with the specific application.

1.3 SPECIAL REQUIREMENTS

- A. Provide complete interface with elevator equipment to comply with ANSI/ASME A17.1c Section 102. Specifically with regard to hoistways for protecting these areas only, the following practices apply:
 - 1. All risers and returns shall be located outside these areas.
 - 2. Branchlines in the hoistway shall supply sprinklers at not more than one floor level.
 - 3. Control valves shall be provided, in accessible locations, for each branchline supplying sprinklers in these spaces.
 - 4. Means shall be provided to automatically disconnect the main line power supply to the affected elevator and machine room prior to the application of water. This means shall not be self-resetting. The activation of sprinklers outside the hoistway shall not disconnect the main line power supply.
- B. Provide complete interface with electrical/transformer rooms and areas in compliance with the NEC. Apply the following practices:

1. Route no piping through electrical rooms with the following exceptions:
 - a. Branch piping supplying sprinklers protecting the electrical room. Note: This branch piping shall not exit the electrical room to supply additional sprinklers outside the room.
 2. No piping shall be routed above electrical panels in compliance with the NEC.
 3. Baffles, as described in NFPA 13, shall be provided to prevent direct sprinkler discharge onto electrical panels.
- C. Provide complete interface with building smoke and fire alarm system.
- D. Provide valve supervision and water flow alarms and trouble signal monitoring system and shall automatically transmit to an approved station in accordance with the International Fire Code.

1.4 CODES AND STANDARDS

- A. IBC Latest Adopted Edition.
- B. NEC Latest Adopted Edition.
- C. UPC Latest Adopted Edition.
- D. IMC Latest Adopted Edition.
- E. IFC Latest Adopted Edition.
- F. NFPA 13 Standard for the Installation of Sprinkler Systems, latest adopted edition.
- G. NFPA 25 Water-Based Fire Protection Systems, latest adopted edition.
- H. NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants, latest adopted edition.
- I. ASCE Standard 7, Minimum Design Loads for Buildings and Other Structures, latest adopted edition.

1.5 RELATED WORK

- A. Division 02, Sitework.
- B. Section 09 90 00, Painting.
- C. Section 22 05 00, Common Work Results for Plumbing.
- D. Section 23 05 00, Common Work Results for HVAC.
- E. Division 26, Equipment Wiring Connections.

- F. Division 28, Fire Alarm and Detection.

1.6 REFERENCES

- A. AWWA C510 Backflow Prevention Devices reduced pressure type and double check valve type.
- B. USC University of Southern California: Foundation for Cross-connection Control and Hydraulic Research.

1.7 QUALITY ASSURANCE

- A. Unless otherwise noted, this is substantially a "performance" specification.
- B. Minimum qualifications of the contractor/subcontractor shall include the following:
 - 1. Specialist Firm: Company specializing in automatic fire protection/sprinkler systems, possessing a minimum of three years' experience with systems similar in nature to the type specified herein.
 - 2. Design Certification: Shop drawings shall be prepared by a person with a minimum certification of level II designer, supervised by a Licensed Professional Engineer or a level III or IV Fire Sprinkler Designer, certified by the National Institute for Certification in Engineering Technologies (NICET), in Fire Protection Engineering Technology Automatic Fire Sprinkler System Layout.
 - 3. Equipment and components: Bear the "UL" label or the "FM" approval marking.
 - 4. Maintain a complete stock of replacement parts.
 - 5. Remain on 24 hour call for emergency service.
 - 6. Maintain an office and telephone, with authorized representatives of the Fire Protection Contractor's firm, including the Designated Project Mechanical Sprinkler Supervisor, with a physical presence and address in Alaska.
 - 7. Bids of wholesalers, contractor or any firm whose principal business is not that of manufacturing and/or installing fire protection systems is not acceptable.
- C. Backflow Prevention: Installation and testing by a certified backflow assembly tester, in accordance with the Uniform Plumbing Code (UPC).

1.8 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submit contractor's qualifications, proof of 3 years' experience under this contractor's firm name, and references for at least 5 projects in Alaska of similar type, size, and complexity.
- C. Submit a copy of designer's NICET certification and resume', or Alaska P.E. license number.
- D. Submit shop drawings and hydraulic calculations concurrently to the engineer and the [City] [State] Fire Marshal for review. Submit one set of stamped approved shop drawings and

hydraulic calculations to the Engineer via the NPS Contracting Officer when available from AHJ. Engineer will retain 1 set of "stamped approved" shop drawings. These sets must include the NICET certification or stamp of a licensed professional engineer as described above.

- E. Submit backflow assembly tester UPC certificate. Submit letter of certification for installation signed by tester.
- F. Submit all written reviews and contractor responses to reviews to the Architect/Engineer.
- G. Submit product data, and sprinkler head layout. Sprinkler head layout shall be reviewed by the Architect/Engineer. All other approvals shall be secured prior to materials fabrication. Additional sprinklers as required shall be added at no additional cost to the contract.
- H. Shop Drawings shall include the following information in compliance with NFPA 13:
 - 1. Name of Government, occupant and Building Permit Number.
 - 2. Location, including street address and legal description.
 - 3. Point of compass.
 - 4. Fire Department Connections.
 - 5. All necessary controlling equipment.
 - 6. Location of water source, type, routing, depth of bury and size of supply piping. Identify location and size of city main and whether it is dead-end or circulating loop, and distance to the flow data test hydrant.
 - 7. All distribution system piping and outlets. Include pipe and fitting types.
 - 8. Location, make, model, size, and power requirements of [dry pipe] [pre-action] system air compressor, [low air alarm switch], air maintenance device, alarm pressure switch as well as the holding capacity, in gallons, for the [dry pipe] [pre-action] system.
 - 9. Reflected ceiling plan showing ceiling heights, construction type, proposed location and type of sprinkler heads, and other ceiling devices such as HVAC diffusers, loud speakers, type and location of light fixtures, etc.
 - 10. Interference control between sprinkler system and other trades.
 - 11. Full height cross section.
 - 12. Location of partitions. Identification of full height walls and draft stops.
 - 13. Location and size of unsprinklered concealed spaces.
 - 14. Identification of unheated areas.
 - 15. Water Flow Test Results; include testing agency; time, date and location of test; actual pitot reading at flow hydrant; and equipment used to perform the test.
 - 16. Make, model, Type, orifice, finish and Temperature rating of sprinklers and their respective locations.
 - 17. On systems that are hydraulically calculated, indicate the square footage area protected by each system.
 - 18. Hydraulic node points.
 - 19. Make, model, and size of all fire protection control valves, alarm valves, hose valves, pumps, controllers, and related equipment, and check valves.
 - 20. Identify low point drain and inspector test stations.
 - 21. Indicate the type and location of all piping hangers and equipment supports.
 - 22. Indicate the type and location of all seismic bracing and restraint.
 - 23. Make, model, size, and locations of all pipe couplings, fittings and flanges.
 - 24. Make, model, size, power requirement, and location of alarm bells, buzzers, detectors, and/or alarm panels.

25. Make, model, size, and configuration of fire pump as well as its installation into the system.
26. Provisions for flushing.
27. Name, address and telephone number of the contractor. If design is by a separate firm, include the name address and telephone number of the design facility.
28. Complete legend of all abbreviations and symbols indicated.
29. Complete schedule of all room occupancies.
30. Location of all unit heaters.
31. Location of all structural penetrations.
32. Note the location of all "exposed" piping.
33. Valve Supervision Alarm:
 - a. Make and model on all supervisory switches, alarm and monitoring panel.
 - b. Shop drawing and wire diagram of alarm system.
 - c. Location of alarm annunciator, or remote monitoring method to be utilized for offsite monitoring.

1.9 MAINTENANCE INFORMATION, FRAMED BUILDING PLAN AND RECORD DRAWINGS

- A. Submit under provisions of Division 01.
- B. Provide a complete building floor plan showing all system control valves, drain stations, air compressors, alarm and control panels, test valves, and other primary fire protection devices. Indicate all sprinkler zones, boundaries, and types of systems. Submit this plan prior to substantial completion for review by the mechanical engineer. Enclose the plan in an architectural metal picture frame with 1/8" rigid clear plastic cover. Minimum 1/2" frame width. Locate the framed plan in the fire protection control valve room on the wall with the spare sprinkler cabinet.
- C. Include step by step instructions to place the fire protection system in service as well as to take it out of service. Provide complete maintenance information of all primary fire protection equipment, including valves, fittings, sprinklers. Identify equipment indicating whether devices are replacement items or repairable. Provide parts list and suppliers for repairable items. Include complete detailed "Record Drawings" and record calculations of the fire protection sprinkler system.
- D. Install one copy of the record hydraulic calculations and shop drawings in a metal sleeve box on the wall near the fire sprinkler riser.
- E. Provide 1 *original* copy of NFPA 25 in each O&M manual.
- F. The contractor shall maintain current and up-to-date "Record Drawings" of the fire protection system at the job site, in accordance with Division 01. Significant changes in piping due to onsite coordination with other trades will require recalculation to confirm adequate pipe sizing.

1.10 REVIEWS, APPROVALS, AND PERMITS

- A. Obtain written review and/or approval of the entire fire protection system design and arrangement from the following authorities:
 - 1. NPS Contracting Officer
 - 2. State of Alaska Fire Marshal.
 - 3. City of Seward Fire Marshal.
- B. Comply with all review comments, revising the system design as required, and resubmitting in a timely manner, so as not to hinder the construction schedule.
- C. Obtain and pay for all required permits, inspections, tests, and approvals as required by authorities having jurisdiction.

1.11 WATER FLOW INFORMATION, HYDRAULIC CALCULATIONS, SEISMIC CALCULATIONS

- A. Obtain and verify the water supply Static Pressure, Residual Pressure, at full flow of the test hydrant, at a time of day, during the peak demand on the system, at the point of connection to the water utility system or at a nearby point acceptable to the approval authority. Obtain this data from actual flow test. Identify the testing agency and the source of the test data.
- B. The test shall be conducted by the designated project Design Supervisor, or Field Superintendent. The test shall be conducted in accordance with NFPA 291, Recommended Practice for Fire Flow Testing and Marking of Hydrants.
- C. Hydraulic Calculations shall be accomplished in compliance with the procedures established in NFPA 13. In addition to minimum NFPA 13 standards, a minimum 15% pressure buffer is required to be designed into the system. Where local authorities require additional buffer, the contractor shall comply with the more demanding requirement.
- D. Hydraulic Calculations accomplished by computer program for submittal shall be accompanied by a complete legend of the abbreviations, nodes, and symbols utilized on the computer readout.
- E. Hydraulic Calculations shall clearly identify the following:
 - 1. System type, sprinkler "K" factor, and "C" factor.
 - 2. Pipe and fittings type.
 - 3. Fitting Equivalent Length chart which complies with the "C" factor and pipe type.
 - 4. NFPA hazard designation, Design Density and size of the Design Remote Area.
 - 5. The Elevation of the "highest" sprinkler.
 - 6. The available water supply and system demand at the point of connection to the water supply, indicated on a logarithmic graph. Include hose demands.
 - 7. Rack Commodity Storage:
 - a. Commodity Type or class.
 - b. Whether the commodity to be stored is encapsulated or not.
 - c. Width of aisles between racks.

- d. Rack configuration, i.e. single row, double row, or multirow racks.
- e. Maximum storage height.

F. Seismic Calculations shall clearly identify the following:

- 1. Type, length and size of brace.
- 2. Angle allowed of brace.
- 3. Maximum horizontal load of brace.
- 4. Brace attachment to structure and load rating.
- 5. Brace attachment to pipe and load rating.
- 6. Calculated load to be braced.

1.12 COORDINATION REQUIRED

- A. The contractor shall examine the structural, architectural, mechanical, electrical and all other drawings relating to the building and plan his work accordingly. He shall check and verify all dimensions at the site before fabricating any portion of the system. Any discrepancies in piping and head locations resulting from failure to do so shall be corrected expeditiously to provide proper coordination of all trades.
- B. Coordinate work with that of other trades to ensure that adequate space is provided for all work, including requirements for serviceability and accessibility. Locate sprinkler heads to avoid conflict with light fixtures and other installed equipment.
- C. Structural penetrations for piping shall be identified and details of those penetrations shall be submitted to the structural engineer for approval, in a timely manner. Structural members which are damaged cut or penetrated without approval shall be replaced at no additional expense to the Government.
- D. Sprinklers shall be "centered" or quarter centered in [one] [both] direction[s] in units of the ceiling suspension system. Adjust the final location of the sprinklers in the field to accomplish these requirements.
- E. Automatic fire protection piping in correctional facilities, psychiatric institutions shall be designed with full consideration given to the building occupants, minimizing inherent health risks caused by self-inflicted injury from the fire protection system. This includes but is not limited to exposed piping, security of all system controls and service points, and sprinkler types specifically listed for institutional application.
- F. Dry Pipe Sprinkler System shall be designed to produce sprinkler flow at the most remote sprinkler, within 60 seconds of system actuation.
- G. Wet pipe sprinkler system piping in residential occupancies shall be designed to locate all wet pipe within the thermal "envelope" and vapor barrier of the building. Absolutely no wet pipe shall be routed in cold attic areas. Wet pipe sprinkler system piping shall not be routed in exterior walls. Piping shall be concealed in interior walls utilizing sidewall sprinkler heads or soffited in below top floor ceilings to provide coverage in compliance with NFPA 13[R].

1.13 MATERIALS HANDLING AND STORAGE

- A. Deliver, store, protect, and handle products to the site under provisions of Division 01. Deliver and store valves in manufacturer packaging with labeling in place. Prior to installation, piping onsite shall be wrapped with protective wrapping. Valves, piping, materials, and equipment shall be clean and new when system is accepted by the Government.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide only new materials and equipment, which are standard products of a manufacturer regularly engaged in the manufacture of fire protection equipment.
- B. All products shall bear the "UL" label or "FM" listing and be specifically approved for fire protection application where they are used.
- C. Products shall be of domestic origin and manufacture.

2.2 PIPING

- A. Wet Pipe Sprinkler Systems:
 - 1. Black steel piping, ASTM A135 schedule 10 or ASTM A795 schedule 40, UL Listed or FM Approved for fire sprinkler service.
 - 2. Piping may be roll-grooved, threaded, flanged, or welded for connection. All threaded pipe shall be schedule 40. No plain-end piping fitting connections are allowed.
 - 3. CPVC plastic piping may be utilized in compliance with the material listing and the manufacturers recommended installation practices.
- B. Dry Pipe Sprinkler Systems:
 - 1. Pipe shall be Galvanized schedule 40 steel pipe. No substitutions allowed.
- C. All piping between the fire protection system connection to the potable water supply and the fire protection backflow prevention device shall be Galvanized piping.
- D. CPVC: Fitting shall be same manufacture as piping, CPVC ASTM F438 schedule 40 for up to 1-1/2 inches, CPVC ASTM F439 schedule 80 for 2 inch and over. Solvent by same manufacture as piping and fittings and as required to meet listing requirements.

2.3 GROOVED FITTINGS, COUPLINGS, AND MECHANICAL TEES

- A. Grooved Fittings shall be Victaulic, Gruvlok, or equal. Galvanized fittings shall accompany galvanized piping. Couplings and mechanical tees shall be standard painted Victaulic, Gruvlok, or equal.

- B. Slip-Fit fittings and couplings utilized for joining branch piping to new main piping shall not be allowed.
- C. Contractor shall follow the manufacturer's suggested methods to prepare, carefully, the ends for these fittings to prevent leakage or system breakdown.

2.4 THREADED PIPE FITTINGS

- A. Threaded pipe fitting for this system shall be cast iron 125# ANSI B16.4 or malleable iron 150# ANSI B16.3.
- B. CPVC: Fitting shall be same manufacture as piping, CPVC ASTM F438 schedule 40 for up to 1-1/2 inches, CPVC ASTM F439 schedule 80 for 2 inch and over. Solvent by same manufacture as piping and fittings and as required to meet listing requirements.

2.5 PIPE FLANGES

- A. Pipe flanges for this system shall be Cast Iron Class 125# ANSI B16.5.

2.6 PIPING HANGERS AND SUPPORTS

- A. Pipe hangers shall conform to NFPA 13 standards.

2.7 FLEXIBLE SPRINKLER HOSE FITTINGS

- A. FM approved and UL listed for use in fire protection service.
- B. Seismically qualified for use pursuant to ICC-ES AC-156 Acceptance Criteria for Seismic Qualification by Shake-Table Testing of Nonstructural Components and Systems.
- C. Composition: 100% Type 304 Stainless Steel. 175 or 300 PSI minimum rated pressure as appropriate for installed system.
- D. Fully welded non-mechanical fittings, braided, leak-tested with minimum 1 inch true-bore internal corrugated hose diameter.
- E. Ceiling bracket of G90 galvanized steel with snap-on clip ends positively attached to the ceiling using tamper-resistant screws. Flexible hose attachment shall be removable hub type with set screw.

2.8 ACCEPTABLE MANUFACTURERS FIRE PROTECTION VALVES AND EQUIPMENT

- A. Reliable.
- B. Tyco.

- C. Potter Electric.
- D. Notifier.
- E. Victaulic.
- F. Potter Roemer.
- G. Croker.
- H. Viking.

2.9 VALVES AND ALARMS ASSEMBLIES

A. Fire Protection Valves:

1. Control Valves: All Fire protection system control valves shall be supervised with switches compatible with the fire alarm system.
 - a. OS&Y Gate Valves: Minimum working pressure 175 PSI non-shock cold water. UL listed for fire protection Victaulic Series 771 or equal.
 - b. Butterfly Valves: UL listed for fire protection 175 PSI non-shock cold water, with integrated supervisory switch. Grooved, threaded, or wafer type acceptable. Victaulic Firelock Series 705 or 707 or equal.
 - c. Swing Check Valves: UL listed for fire protection 175 PSI non-shock cold water, ductile iron body, stainless steel clapper assembly. Grooved, flanged, or wafer type acceptable. Victaulic Firelock Series 717 or equal.

B. Wet Pipe Sprinkler Systems:

1. Alarm Check Valve Assemblies.
 - a. Provide sprinkler alarm valve assemblies, appropriate to the system, complete with all trimmings and accessories for proper alarm initiation and interface with fire alarm system. Include inlet and outlet pressure gauges, and main drain with discharge to the outside.
2. Water Flow Detectors:
 - a. Provide water flow detectors installed at each system or zone control and for the main system header for multiple zone systems. Potter Electric, model VSR-F.

C. Dry Pipe Sprinkler Systems:

1. Dry Pipe Valve:
 - a. Dry Pipe Valve, complete with all required trimmings, including inlet and outlet pressure gauges and main drain that discharges outside. Victaulic Firelock NXT, or equal.

- b. Pressure Switch: To signal system discharge. Potter Electric Model PS-10 or equal.
- c. Low Air Alarm Switch: To signal low air pressure in the dry pipe fire protection system. Potter Electric Model PS-40-2 or equal.
- d. Accelerator: As required. Compatible with the Dry Pipe Valve. Central Model A, with trim or equal.
- e. Air Maintenance Device: As required, compatible with specified dry pipe systems and specified air supply, Victaulic Firelock Series 757 or equal.
- f. Air Compressor: Oil-less and riser or tank mounted as required. Sized as required by NFPA 13 standards and compatible with available power as specified in Division 26. UL 2125 Listed. General Air Products or equal.

D. All electrical alarm and control wiring shall be provided in accordance with Division 26.

2.10 ELECTRIC ALARM

- A. Electrically operated 10" diameter red gong.

2.11 FIRE DEPARTMENT CONNECTION

- A. Provide 4" connection with two 2-1/2" female threaded hose connections. Coordinate thread type with local fire department.
 - 1. All exposed surfaces to be polished chrome.
 - 2. Connection to be complete with 1/2" automatic ball drip.
 - 3. Escutcheon Plate to be labeled AUTO SPRINKLER.
 - 4. Provide 2-1/2" x 2-1/2" x 4" Fire Department roof manifold with escutcheon plate at location indicated on the plans.
 - 5. Provide 2-1/2"x 2-1/2" x 4" Fire Department roof manifold with escutcheon plate, Wall Post Indicator and gate valve as indicated on the drawings.
 - 6. Provide signage over the FDC as required by the AHJ and architectural plans and specifications.

2.12 SPRINKLERS

- A. Provide sprinklers as required by NFPA 13 standards and in compliance with the IBC chapter 9 for the entire project. Sprinkler finish and style as follows:
 - 1. In all areas with surface mounted light fixtures attached to finished suspended ceilings, provide standard spray pendant sprinklers, and extended escutcheons to position the sprinkler deflector below the light fixture. Sprinklers and escutcheons to be white finish. Tyco TY-FRB or equal.
 - 2. In all areas with recessed lighting flush to the suspended ceiling finish, provide recessed standard spray pendant sprinklers. Sprinklers and escutcheons to be white finish. Tyco TY-FRB or equal.
 - 3. Sprinklers throughout shop and mechanical service areas shall be bronze finish, standard spray, upright or pendant type as required by the drawings.

4. Sidewall sprinklers shall be bronze finish in all service areas, and white throughout all public areas.
5. Dry pendant sprinklers protecting entry vestibules (white finish) and outside overhangs (chrome finish) shall be Tyco DS-1 recessed or equal. Dry pendant sprinklers protecting unheated areas and piped from wet pipe systems shall have an "A Length" dimension of not less than 18".
6. Second floor sprinklers shall be dry pendant type connected to the dry system in the cold attic where shown on the plans. Tyco DS-1 or equal.
7. Sprinkler Guards shall be of the same manufacturer and finish as the sprinkler which they are to be installed on. Red guards are acceptable for bronze sprinklers only. White finish guards are required for white sprinkler heads.
8. Sprinklers of correct temperature rating shall be installed according to NFPA 13.
9. Sprinklers for new additions of existing facilities shall match Make, Model, and finish for existing sprinklers, while complying with NFPA 13 standards, provided those sprinklers are still being manufactured.
10. Provide sprinkler wrenches for each type of sprinkler.
11. Spare sprinkler cabinet to be red sheet steel manufactured by the same company that made the sprinklers. Size the cabinet in accordance with NFPA 13 standards. Provide sprinklers for the cabinet representative of the assortment provided for the system. Mount cabinet on the wall within 60" of the sprinkler control riser.

2.13 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTERS

- A. Watts.
- B. Hersey.
- C. Cla-Val.
- D. Febco.
- E. Wilkins.
- F. Substitutions: Under provisions of Division 01.

2.14 BACKFLOW PREVENTERS

- A. General: IAPMO (UPC) approved.
- B. Double Check Valve Assemblies: ASSE 1015; Two independent check modules within a single housing, four test cocks, and two resilient seated drip tight shutoff valves. The check valves shall be removable and serviceable without the use of special tools. Check valves shall have reversible elastomer discs and shall produce drip tight closure against the reverse flow of liquid caused by backpressure or backsiphonage. Assembly shall be available in horizontal, vertical, or N pattern installations. Lead free construction. Shutoff valves shall include integral tamper switches. Ames C200 or equal.

- C. Reduced Pressure Zone Assembly: ASSE 1013; The assembly shall consist of a pressure differential relief valve located in a zone between two positive seating cam-check assemblies. The cam-check assemblies shall be removable without the use of special tools. The assembly shall include two resilient seated drip tight shutoff valves and four test cocks. Assembly shall be available in horizontal, vertical, or N pattern installations. Lead free construction. Shutoff valves shall include integral tamper switches. Ames 4000SS or equal.

PART 3 - EXECUTION

3.1 CONTRACTOR COORDINATION

- A. The fire protection contractor shall coordinate his work with the work of all other trades to assure timely installation and efficient use of mechanical areas including but not limited to boiler rooms, fan rooms, and ceiling spaces.
- B. Any work installed without proper coordination shall be promptly removed and reinstalled in a manner to allow for a good practical arrangement of all items which need to be installed by all crafts involved.
- C. In case of coordination dispute, the Architect/Engineer shall be consulted and his decision shall be binding.
- D. All costs associated with coordination and arranging or rearranging of the fire protection system shall be borne by the affected contractor, without causing any additional expense to the Government.

3.2 PIPING INSTALLATION

- A. Install piping to conserve building space and route piping around access panels and openings. Piping shall not restrict any access opening.
- B. Install low point drain stations in accordance with NFPA 13 standards. Identify the location of drain and test stations with signs on access panels, ceiling panels, or walls adjacent to the station, visible from the floor. Discharge all test pipes and system main drain to outside. Coordinate discharge point with Government's field representative.
- C. Provide seismic protection for the piping system in accordance with NFPA 13 standards. Attach bracing to structure with through bolts, washers, and nuts. Provide clearance at all structural penetrations. Provide oversized escutcheon plates or flexible connections where sprinklers penetrate non-frangible ceiling membranes.
- D. Dry system piping shall be installed to allow full service and complete drainage of the entire system. All dry piping shall be sloped to accomplish this requirement.
- E. Piping shall be concealed in all areas with finished ceilings.
- F. Piping concealed in walls shall be secured to studs 48" - 60" above the floor.

- G. Pipe penetrations through rated fire walls shall be sealed by a "UL" listed system utilizing fire rated caulking. Submit data under paragraph 1.8 (Submittals) of this specification.
- H. When piping is supported from manufactured structural members, the Installation of pipe hangers shall comply with truss manufacturer's recommendations for hanger attachments and loading.
- I. When pipe hangers are attached to bar joist with wood top and bottom chords, chords shall be predrilled for fasteners, and fasteners shall maintain a minimum distance of 0'-6" from truss "panel points".
- J. Pipe hangers shall be "Rod and Ring" type hangers throughout. Piping hangers shall have a minimum of ½" of adjustment on each side of the hanger ring nut, to allow for piping grade adjustment in the future.
- K. All "beam clamp" type fasteners shall be installed with retainer straps and locking nuts.
- L. All Trapeze members shall be fastened to truss chords or structural members.
- M. Provide isolation mounts for air compressor.
- N. Installation of all valves and equipment shall comply with manufacturer's suggested installation practices and directions.
- O. Provide service access around all equipment.

3.3 SYSTEM TEST

- A. Hydrostatically test the entire system in accordance with NFPA 13 standards.
- B. Test all system alarm actuations and alarms.
- C. Trip test dry pipe system to confirm system discharge time.
- D. Perform main drain test.
- E. 48-hour advance notice required for all tests to allow Government's field representative to witness these tests.

3.4 PAINTING

- A. Refer to Division 09.

3.5 PROJECT CLOSEOUT

- A. The fire protection contractor shall submit a written affidavit at the completion of the system, stating that the fire protection system as installed complies with all referenced codes and standards, State of Alaska Fire Marshal's Office, and the City of Seward Fire Marshal's Office.

- B. Furnish Written Guarantee to the Government, that materials installations are free from mechanical defects and guaranteeing to replace and repair any and all unsatisfactory and defective work and items, to the satisfaction of the Government, in a timely manner, for a period of one year after final acceptance of the building by the Government, and to be responsible for any damage caused to the premises for any such unsatisfactory work.
- C. The contractor shall respond with in reasonable time, not to exceed 15 days to repair or replace latent or hidden defects at such time as they are discovered.
- D. Provide hydraulic placard on system riser. Placard shall indicate sprinkler demand and hose demand as separate numbers.
- E. Post the results of the original main drain test and date performed on the system riser in a permanent fashion.
- F. Contractor shall fully train the Government's designated maintenance engineer in the operation and maintenance of the entire fire protection system.

END OF SECTION 21 05 00

SECTION 22 05 00

COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SCOPE

- A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.2 WORK INCLUDED

- A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.
- B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.3 RELATED WORK

- A. Related Work Specified Elsewhere:
 - 1. Electrical Specifications: Division 26.
 - 2. Motors and Connections: Division 26.
 - 3. Starters and Disconnects: Division 26.
- B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 22 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.
- C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.4 REFERENCED CODES - LATEST ADOPTED EDITION

- A. NFPA 13 Installation of Sprinkler Systems.
- B. NFPA 70 National Electrical Code (NEC).
- C. IMC International Mechanical Code.

- D. UPC Uniform Plumbing Code.
- E. IECC International Energy Conservation Code.
- F. IFC International Fire Code.
- G. IBC International Building Code.

1.5 PROJECT RECORD DRAWINGS

- A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.
- B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.
- C. Show the location of all valves and their appropriate tag identification.
- D. At completion of project, deliver these drawings to the NPS Contracting Officer and obtain a written receipt.

1.6 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.
- B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.
- C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.
- D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.
- E. Submit product data for:
 - 1. Hangers and Supports for Plumbing Piping and Equipment.
 - 2. Vibration and Seismic controls for Plumbing Piping and Equipment.
 - 3. Identification for Plumbing Piping and Equipment.
- F. Provide shop drawings with calculations for selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the State of

Alaska. Seismic calculations shall be based upon Seismic Category as indicated in the structural documents. Components shall utilize an IP of 1.0 for seismic calculations.

1.7 OPERATING AND MAINTENANCE MANUALS

- A. Submit maintenance manuals to the Engineer covering all equipment, fixtures, devices, etc. installed by the Contractor.
- B. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:
 - 1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
 - 2. Catalog cuts of all equipment, fixtures, etc. installed (Marked to identify the specific items used).
 - 3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
 - 4. Identification numbers of all parts and nearest sources for obtaining parts and services.
 - 5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
 - 6. A copy of the final test and balance report.
 - 7. A copy of valve schedule and reduced scale drawings showing valve locations.
 - 8. Written summary of instructions to Government.
 - 9. All manufacturers' warranties and guarantees.
 - 10. Contractors Warranty Letter.
- C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.8 HANDLING

- A. See General Conditions and the General Requirements in Division 01 regarding material handling.
- B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.9 SUBSTITUTIONS

- A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.
- B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The NPS Contracting Officer shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.
- B. Any differences, which may be found, shall be submitted to the NPS Contracting Officer for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

- A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

- A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

- A. The Contractor under each section shall at his own expenses perform the various tests as specified and required by the Architect and as required by applicable code, the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.14 TERMINOLOGY

- A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.

- B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.
- C. The use of the word "shall" conveys a mandatory condition to the contract.
- D. "This section" refers to the section in which the statement occurs.
- E. "The project" includes all work in progress during the construction period.
- F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

- A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

- A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.
- B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

- A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Government. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Guarantee shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

- A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
2. Contractors One Year Warranty.
3. All Manufacturers' Guarantees.
4. Test and Balance Reports.
5. Operation and Maintenance Manuals.

1.19 INSPECTION OF SITE - REMODEL PROJECTS

- A. The accompanying plans do not indicate completely the existing mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.20 RELOCATION OF EXISTING INSTALLATIONS

- A. There are portions of the existing mechanical systems, and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.21 SALVAGE MATERIALS

- A. The Contractor shall remove existing fixtures, equipment and other items associated with the plumbing systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.
- B. All items or materials demolished from the project shall be Contractor's salvage and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.

- B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.2 RESTRICTED MATERIALS

- A. No materials containing asbestos in any form shall be allowed.
- B. No solder or flux containing lead shall be used on this project.
- C. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be "lead free" in accordance with the Safe Drinking Water Act, Section 1417. "Lead free" materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.
- D. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.3 ELECTRICAL MOTORS

- A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.
- B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.
- C. Size motors for 1.15 service factor and not to exceed 40° C temperature rise above ambient.
- D. Fractional horsepower motors to have self-resetting thermal overload switch.
- E. Provide NEMA Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

2.4 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

- A. Plastic Nameplates: Laminated plastic with engraved letters.
- B. Plastic Tags: Laminated plastic with engraved letters, minimum 1-1/2 inches diameter.

- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, for direct burial service.

2.5 PIPE HANGERS AND SUPPORTS

A. Acceptable Manufacturers:

- 1. Anvil.
- 2. B-Line Systems, Inc.
- 3. Erico.
- 4. PHD Manufacturing, Inc.
- 5. Tolco.

B. Plumbing Piping - DWV:

- 1. Conform to ANSI/MSS SP58.
- 2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
- 3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- 6. Wall Support for Pipe Sizes 4 Inches: Welded steel bracket and wrought steel clamp.
- 7. Vertical Support: Steel riser clamp.
- 8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- 9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.

C. Plumbing Piping - Water:

- 1. Conform to ANSI/MSS SP58.
- 2. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron or carbon steel, adjustable swivel, split ring.
- 3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
- 4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
- 5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- 6. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
- 7. Wall Support for Pipe Sizes 4 Inches: Welded steel bracket and wrought steel clamp.
- 8. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- 9. Vertical Support: Steel riser clamp.
- 10. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 12. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with neoprene isolation pad.
 13. Design hangers to allow installation without disengagement of supported pipe.
 14. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe, except hanger rings with factory-applied 1/16 inch minimum thick plastic or tape cushion strip over all contact surfaces.
 15. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 570 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.
- D. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield over insulation in 180° segments, minimum 12 inches long at pipe support.
- E. Shield for Insulated Piping 2 Inches and Larger: Hard block, calcium silicate insert, 180° segment, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.
- F. Shields for Vertical Copper Pipe Risers: Galvanized steel pipe.

2.6 HANGER RODS

- A. Steel Hanger Rods: Mild steel, threaded both ends, threaded one end, or continuous threaded. Minimum Hanger Rod Sizes:

PIPE AND TUBE SIZE (INCHES)	ROD SIZE (INCHES)
¼-4	3/8

2.7 INSERTS

- A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.8 ANCHOR BOLTS

- A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.9 EQUIPMENT CURBS

- A. Fabricate curbs of concrete or steel beam, unless specifically called out otherwise.

2.10 FLASHING

- A. Metal Flashing: 26-gauge minimum galvanized steel.
- B. Metal Counter Flashing: 22 gauge minimum galvanized steel.
- C. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.
- D. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

2.11 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gauge galvanized steel for 4 inch diameter, 22 gauge up to 3" diameter.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel for 4 inch diameter, 22 gauge up to 3" diameter.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals or UL listed caulking system.
- D. Fire Stopping Insulation: Mineral fiber type, non- combustible.
- E. Caulk: Fire stop sealant in compliance with ASTM E814, UL 1479 and Division 07.
- F. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.12 ACCEPTABLE MANUFACTURERS: VIBRATION ISOLATORS AND SEISMIC RESTRAINT

- A. Vibration isolators and Seismic Restraint shall be manufactured by:
 - 1. Amber/Booth.
 - 2. Cooper Industries.
 - 3. International Seismic Application Technology.
 - 4. Kinetics Noise Control.
 - 5. Mason Industries.
 - 6. Vibro-Acoustics.

- B. Substitutions: Items of same function and performance are acceptable in conformance with Division 01.

2.13 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

A. General:

1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.
2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

- B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.14 SEISMIC BRACING COMPONENTS

- A. Steel strut shall be 1-5/8 wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.

1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.
2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.
3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.
4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS, Gr.33.
5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

2.15 VIBRATION ISOLATORS (ROTATING EQUIPMENT)

- A. Floor Mount: Closed spring mount with iso-stiff springs and limit stop for seismic restraint. Isolators are to be sized and selected by equipment manufacturer.
- B. Hangers: Closed spring hanger with acoustic isolator.
- C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.

- D. Color code spring mounts, spring selected to operate at no greater than 2/3 solid deflection and have 1/4" ribbed neoprene pads.

2.16 LIMITS OF VIBRATION

- A. The factory is to statically and dynamically balance all rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor.
- B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment HP, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.
- C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.17 EARTHQUAKE BUMPERS AND SNUBBERS

- A. Bumpers:
 - 1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.
 - 2. Attach one or more elastomeric mountings to pad the 6" leg of the angle iron.
 - 3. Design the mounting to deflect not more than 3/4" under the shock loading of 1 g in any direction in the horizontal plane.
 - 4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or similar.
- B. Snubbers:
 - 1. Interlocking steel members restrained by shock absorbent rubber materials.
 - 2. Elastomeric materials shall be replaceable and a minimum of 3/4" thickness.
 - 3. Maintain 1/8" air gap in all directions in design of snubber.
 - 4. Acceleration of 4 g's in any direction.
 - 5. All-directional restraint.
 - 6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

PART 3 - EXECUTION

3.1 DRAWINGS

- A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see

Architectural, Structural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.2 INSTALLATION

- A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NEC, NFPA, IECC, and IFC Standards; all local and state amendments to all codes and standards.
- B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.
- C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.3 MEASUREMENTS

- A. Verify all measurements on the job site.
- B. Locate all equipment and fixtures on the centers of walls, openings, spaces, etc., unless specified otherwise.
- C. Check all piping, equipment, etc. to clear openings.
- D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.4 OPERATING INSTRUCTIONS

- A. Before the facility is turned over to the Government, instruct the Government or Government's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.
- B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of onsite instruction to the Government designated personnel.
- C. When required by individual specification sections provide additional training on plumbing systems and equipment as indicated in the respective specification section.
- D. Provide schedule for training activities for review prior to start of training.

3.5 SYSTEM ADJUSTING

- A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all plumbing systems. Test all plumbing equipment, fixtures and piping for

proper water distribution, drainage, pressure and flow, adjust systems as required to eliminate splashing, noise and vibration.

3.6 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

- A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.
- B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for piping.
- C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.7 PAINTING

- A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
 - 1. Factory applied prime and finish coats on mechanical equipment.
 - 2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
 - 3. Factory applied prime coat on access doors.
 - 4. Pipe identification where specified.
- B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.8 IDENTIFICATION

- A. Tag all valves with heat resistant laminated plastic labels or brass tags engraved with readily legible letters. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten directory under glass, and installed where directed. Provide complete record drawings that show all valves with their appropriate label. Seton 250-BL-G, or 2961.20-G, 2" round or equal.
- B. Label all equipment with heat resistant laminated plastic labels having engraved lettering ½" high. If items are not specifically listed on the schedules, consult the Engineer concerning designation to use. Seton engraved Seton-Ply nameplates or equal.
- C. Identify piping to indicate contents and flow direction of each pipe exposed to view by a labeled sleeve in letters readable from floor at least once in each room and at intervals of not more than 20' apart and on each side of partition penetrations. Coloring scheme in accordance with ANSI A13.1-1981, Seton Opti-Code or equal.

3.9 PIPE HANGERS AND SUPPORTS

A. Support plumbing piping in accordance with the latest adopted edition of the UPC.

B. Support horizontal piping as follows:

MATERIALS	TYPES OF JOINTS	HORIZONTAL	VERTICAL
Cast-Iron Hub-less	Shielded Coupling	Every other joint, unless over 4 feet then support each joint ^{1,2,3,4}	Base and each floor, not to exceed 15 feet
Copper Tube and Pipe	Soldered or Brazed	1 ½ inches and smaller, 6 feet; 2 inches and larger, 10 feet	Each floor, not to exceed 10 feet ⁵
Steel and Brass Pipe for Water or DWV	Threaded or Welded	¾ inch and smaller, 10 feet; 1 inch and larger, 12 feet	Every other floor, not to exceed 25 feet ⁵
Steel, Brass, and Tinned Copper Pipe for Gas	Threaded or Welded	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1 ¼ inches and larger, 10 feet	½ inch, 6 feet; ¾ inch and 1 inch, 8 feet; 1 ¼ inches every floor level
Schedule 40 PVC and ABS DWV	Solvent Cemented	All sizes, 4 feet; allow for expansion every 30 feet ^{3,6}	Base and each floor ⁷ provide mid-story guides; provide for expansion every 30 feet ⁶
CPVC	Solvent Cemented	1 inch and smaller, 3 feet; 1 ¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides ⁶
Copper	Mechanical	In accordance with standards acceptable to the Authority Having Jurisdiction	
Steel and Brass	Mechanical	In accordance with standards acceptable to the Authority Having Jurisdiction	
PEX	Cold Expansion, Insert and Compression	1 inch and smaller, 32 inches; 1 ¼ inches and larger, 4 feet	Base and each floor; provide mid-story guides
PEX-AL-PEX	Metal Insert and Metal Compression	½ inch, ¾ inch, 1 inch, All sizes 98 inches	Base and each floor; provide mid-story guides
PE-AL-PE	Metal Insert and Metal Compression	½ inch, ¾ inch, 1 inch, All sizes 98 inches	Base and each floor; provide mid-story guides
Polypropylene (PP)	Fusion weld (socket, butt, saddle, electrofusion), threaded (metal threads only), or mechanical	1 inch and smaller, 32 inches; 1 ¼ inches and larger, 4 feet ⁷	Base and each floor; provide mid-story guides ⁷

Notes:

¹ Support adjacent to joint, not to exceed 18 inches.

² Brace not to exceed 40 foot intervals to prevent horizontal movement.

³ Support at each horizontal branch connection.

⁴ Hangers shall not be placed on the coupling.

⁵ Vertical water lines shall be permitted to be supported in accordance with recognized engineering principles with regard to expansion and contraction, where first approved by the Authority Having Jurisdiction.

⁶ See the appropriate IAPMO Installation Standard for expansion and other special requirements.

⁷ See manufacturer installation instructions for additional requirements.

C. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.

D. Place a hanger within 12 inches of each horizontal elbow.

E. Use hangers with 1-½ inch minimum vertical adjustment.

F. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.

G. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.

H. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

I. Support riser piping independently of connected horizontal piping.

J. Provide transverse seismic support for all piping systems.

3.10 INSERTS

A. Provide inserts for placement in concrete formwork.

B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.

D. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.

E. Where inserts are omitted, drill through concrete slab from below and provide thru-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.11 EQUIPMENT BASES AND SUPPORTS

A. Provide equipment bases of concrete type where shown on plans.

B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.

C. Construct support of steel members. Brace and fasten with flanges bolted to structure.

D. Provide rigid anchors for pipes after vibration isolation components are installed.

- E. Anchor (Expansion) Bolts: Install anchor bolts for all plumbing piping and equipment as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where piping and equipment is hung. Install anchor (expansion) bolts in holes drilled in concrete where necessary to hang piping or equipment, or to anchor stationary equipment from existing concrete slabs.

3.12 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping penetrates weather or waterproofed walls, floors, and roofs.
- B. Flash vent pipes projecting 3 inches minimum above finished roof surface with pre-manufactured butyl boot.
- C. Seal floor drains watertight to adjacent materials.

3.13 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Set sleeves in position in construction. Provide reinforcing around sleeves.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.
- D. Where piping penetrates floor, ceiling, or wall, install sleeve, close off space between pipe and adjacent work with fire stopping insulation and caulk seal. Use fire rated caulking where fire rated walls are penetrated. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.14 SEISMIC RESTRAINT

- A. General:
 - 1. All piping and equipment shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
 - 2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.

3. Attachment to structure for suspended pipe and equipment: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.
5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.
6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.
7. Where rigid restraints are used on equipment or piping, support rods for the equipment or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.
8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Equipment Restraints:

1. Seismically restrain equipment all equipment. Install fasteners, straps and brackets as required to secure the equipment.
2. Install seismic snubbers on HVAC equipment supported by floor-mounted, non-seismic vibration isolators. Locate snubbers as close as possible to vibration isolators and attach to equipment base and supporting structure as required.
3. Install neoprene grommet washers on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 1/8" (3.2 mm).
4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

D. Piping Systems:

1. For projects with a Seismic Design Category of C, provide seismic cable restraints on the following:
 - a. All piping systems assigned a component importance factor, I_p , of 1.5 with a nominal pipe diameter greater than 2" (50 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
 2. For projects with a Seismic Design Category of D, E or F, provide seismic cable restraints on the following:
 - a. All piping greater than 3" (75 mm) nominal diameter.
 - b. All piping systems assigned a component importance factor, I_p , of 1.5 with a nominal pipe diameter greater than 1" (25 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).
 3. "12-inch rule", where pipe can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:
 - a. Hangers are detailed to avoid bending of the hangers and their attachment; and provisions are made for piping to accommodate expected deflections. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
 - b. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.
 4. Restraint spacing:
 - a. For ductile piping, space lateral supports a maximum of 40' (12 m) o.c., and longitudinal supports a maximum of 80' (24 m) o.c.
 - b. For non-ductile piping (e.g., cast iron, PVC) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
 - c. For piping with hazardous material inside (e.g., natural gas, medical gas) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
 - d. For pipe risers, restrain the piping at floor penetrations using the same spacing requirements as above.
 5. Brace a change of direction longer than 12' (3.7 m).
 6. Longitudinal restraints for single pipe supports shall be attached directly to the pipe, not to the pipe hanger.
 7. For supports with multiple pipes (trapezes), secure pipes to trapeze member with clamps approved for application.
 8. Piping on roller supports shall include a second roller support located on top of the pipe at each restraint location to provide vertical restraint.
- E. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.
- F. Install flexible metal hose loops in piping which crosses building seismic joints, sized for the anticipated amount of movement.

- G. Install flexible piping connectors where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.
- H. Coordinate seismic restraints with thermal expansion compensators, guides and anchor points. Thermal expansion anchor points shall be designed to accommodate seismic forces.

3.15 SCOPE OF VIBRATION ISOLATION WORK

- A. All vibrating equipment and the interconnecting pipe shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.
- B. Plumbing equipment shall be carefully checked upon delivery for proper mechanical performance, which shall include proper noise and vibration operation.
- C. All installed rotating equipment with excessive noise and/or vibration, which cannot be corrected in place, shall be replaced at no cost to Government.

3.16 GENERAL PROCEDURES – VIBRATION ISOLATION

- A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.
- B. Install isolators so they can be easily removed for replacement.
- C. Mount all equipment absolutely level.
- D. Install all isolators per manufacturer's instructions.
- E. Install vibration isolators for mechanical motor driven equipment.
- F. Set steel bases for 1" clearance between housekeeping pad and base.
- G. All vibration isolated equipment shall be fitted with earthquake bracing and snubbers suitable for seismic control in accordance with the IBC.
- H. Piping vibration isolation flexible connections shall be installed at a 90° angle to equipment deflection direction unless otherwise noted.

3.17 INSTALLATION OF EQUIPMENT

- A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

- B. Maintain manufacture recommended minimum clearances for access and maintenance.
- C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.
- D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, equipment and accessories installed under this Division. Use structural supports suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.
- E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.
- F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION 22 05 00

SECTION 22 05 19

METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water Meters.
- B. Pressure Gauges and Pressure Gauge Taps.
- C. Thermometers and Thermometer Wells.
- D. Flow Indicators.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 22 10 00 - Plumbing Piping: Installation of thermometer wells, pressure gauge tappings.

1.3 REFERENCES

- A. ASTM E1 - Specification for ASTM Thermometers.
- B. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.
- C. AWWA C700 - Cold Water Meters - Displacement Type.
- D. AWWA C706 - Direct Reading Remote Registration Systems for Cold Water Meters.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.
- C. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Division 01.
- B. Accurately record actual locations of instrumentation.

1.6 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Terice.
- B. Marsh.
- C. Ashcroft.
- D. Enerpac.
- E. Sisco.
- F. Petersen.
- G. Weiss.
- H. Winters.
- I. Substitutions: In accordance with Division 01.

2.2 PRESSURE GAUGES

- A. 3-1/2 inch diameter cast aluminum case, phosphor bronze bourdon tube, rotary bronze movement, brass socket, with silicone fluid dampening black figures on white background, one percent mid-scale accuracy, scale calibrated in psi. Model 600CB as manufactured by Terice.

2.3 PRESSURE GAUGE TAPS

- A. Gauge Isolation Valve: Lever handle ball valve, forged brass body, chrome plated brass ball, viton o-rings for maximum 150 psig. Model Mini T-82-M as manufactured by Jomar or approved equal.
- B. Needle Valve: Brass for maximum 150 psig. Model 735 as manufactured by Terice or approved equal.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections. Series 870 as manufactured by Terice or approved equal.

2.4 STEM TYPE THERMOMETERS

- A. 9 inch scale, universal adjustable angle, blue organic spirit fill, lens front tube, cast aluminum case with blue epoxy finish and clear acrylic window, extended brass stem, cast aluminum adjustable joint with positive locking device, 2 percent of scale accuracy to ASTM E77, scale calibrated in both degrees F and degrees C. BX9 series as manufactured by Terrice.

2.5 SOLAR DIGITAL THERMOMETERS

- A. Hi-impact ABS case; -50/300°F switchable range; 1/2" LCD digits, wide ambient formula display; 1% accuracy; 1/10°F between -19.9/199.9°F resolution; 10 Lux (one foot-candle) LUX rating; 10 second update rate; -30/140°F ambient operating range; Glass passivated thermistor – NTC sensor. Model Digital Vari-angle as manufactured by Weiss Products.

2.6 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required.

2.7 WATER METERS (LIQUID)

- A. Manufacturers:
 - 1. Neptune.
 - 2. Badger Meters.
 - 3. Hersey.
 - 4. Substitutions: Under provisions of Division 01.
- B. Positive Displacement Meter, service size up to 2" - Nutating disc positive displacement type suitable for fluid with hermetically sealed register. All components of lead-free bronze alloy. Permanently sealed register or encoder with magnetic drive register coupling. Conforming to AWWA Standard C700.
- C. Compound Meter service size 2" - 6" Compound dual turbine measuring elements suitable for fluid with dual hermetically sealed registers. All components of lead-free bronze alloy. Permanently sealed register or encoder with magnetic drive register coupling. Conforming to AWWA Standard C700. Neptune T-10 meter or approved equal.
- D. Electromagnetic Flow Meter. Metering system shall be capable of measuring the volumetric flow rate of liquids having an electrical conductivity as low as 5.0 microohms per centimeter. Metering tube constructed of 316 stainless for steel pipe flanges per ANSI B16.5 with insulating liner material made of a NSF-listed hard rubber or an NSF-listed PTFE. Measurement electrodes of Alloy C or 316 stainless steel. NEMA 4X detector and signal amplifier housing. Provide 4 digital outputs, one analog output, and Modbus/RTU protocol. Neptune TRU/FLO compound meter or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install water meters with strainer upstream and isolating valves on inlet and outlet. Provide pressure gauge downstream of check valve.
- C. Install pressure gauges with pulsation dampers. Provide needle valve or gauge isolation valve to isolate each gauge.
- D. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Select bulb length to reach centerline of pipe.
- E. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets.
- F. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- G. Install gauges and thermometers in locations where they are easily read from normal operating level.

3.2 PRESSURE GAUGE SCHEDULE

LOCATION	SCALE RANGE
Pumps less than 40' TDH	0 - 30 PSIG
Pumps more than 40' TDH	0 - 60 PSIG
Domestic Water System	0 - 100 PSIG
Others	As applicable

3.3 STEM TYPE THERMOMETER SCHEDULE

LOCATION	SCALE RANGE
Domestic Cold water system	0 - 100°F
Domestic Hot Water Supply and Recirc.	0 - 200°F
Others	As applicable

3.4 POSITIVE DISPLACEMENT METER SCHEDULE

LOCATION	SCALE RANGE
Domestic cold water	0 - 300 GPM

END OF SECTION 22 05 19

SECTION 22 07 00
PLUMBING INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping Insulation.
- B. Equipment Insulation.
- C. Jackets and Accessories.

1.2 RELATED WORK

- A. Division 09 - Painting: Painting Insulation Jacket.
- B. Section 22 05 00 - Common Work Results for Plumbing.
- C. Section 22 10 19 - Plumbing Specialties.
- D. Section 22 40 00 - Plumbing Fixtures.

1.3 REFERENCES

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ANSI/ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- C. ANSI/ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- D. ASTM C450 - Standard Practice for Fabrication of Thermal Insulating Fitting Covers for NPS Piping, and Vessel Lagging.
- E. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- F. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- G. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- H. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.

- I. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- J. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- K. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- L. ASTM C1427 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- M. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.
- N. ASTM E84 - Surface Burning Characteristics of Building Materials.
- O. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials.
- P. NFPA 255 - Surface Burning Characteristics of Building Materials.
- Q. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with three years minimum experience.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723, ASTM E84, or NFPA 255.
- D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include product description, thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.

1.6 DELIVERY STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Armacell.
- B. Certain-Teed.
- C. IMCOA.
- D. Johns Manville.
- E. Knauf.
- F. Owens-Corning.
- G. Nomaco.
- H. Pittsburgh - Corning.
- I. K-Flex USA.
- J. TRUEBRO.
- K. Substitutions: Under provisions of Division 01.

2.2 INSULATION - PIPING

- A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.23 at 75° F, rated from 0° F to 850° F, vapor retarder jacket of Kraft paper bonded to aluminum foil, self-sealing lap and butt strips; Johns Manville "Micro-Lok" or approved equal.
- B. Type B: Elastomeric foam; EPDM-based closed-cell flexible foam, ASTM C534; flexible cellular elastomeric in sheet or pre-formed tube, 'k' value of 0.26 at 75° F, max. service temp - 300° F, ASTM C534; max. flame spread = 50, max. smoke developed = 50, ASTM E84; UV-resistant coating/jacketing if exposed to sunlight; K-FLEX USA "Insul-Tube", "Insul-Sheet", or approved equal.

- C. Type C: Expanded polystyrene; ANSI/ASTM C578; rigid closed cell; maximum water vapor transmission rating of 0.1 perms; 'k' value of 0.23 at 75° F.
- D. Type D: Flexible unicellular polyolefin; ASTM C1427; 'k' value of 0.25 at 75° F ASTM C518; moisture vapor transmission of zero perm-inch ASTM E96; rated to 210° F; IMCOA "Imcolock" or approved equal.
- E. Type E: ADA insulation; preformed cellular foam, preformed for P-trap and hot water angle stop and supply tube at handicap sinks and lavatories; in compliance with the Americans with Disability Act (ADA); TRUEBRO "Lav Guard 2" or approved equal.

2.3 INSULATION - EQUIPMENT

- A. Type H: Rigid fiberglass board with FSK outer facing. Foil-Scrim-Kraft (FSK) facing of aluminum foil reinforced with fiberglass yarn and laminated with fire-resistant adhesive to kraft paper, 3.0 lbs./cu. ft. density, ASTM C612, 'k' value of 0.23 at 75° F, 450° F maximum service temperature; Johns Manville 814"Spin-Glas" Removable Blankets or approved equal.

2.4 FIELD APPLIED JACKET

- A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. PVC Jackets and solvent welding adhesive: One piece, pre-molded type, Johns Manville "Zeston 2000", fitting covers and jacketing material. Johns Manville "Perma-Weld" solvent welding adhesive.
- C. Aluminum Jackets: ASTM B209; 0.016 inch thick; corrugated or textured finish, longitudinal slip joints.
- D. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.
- E. Re-Wettable Canvas Jacketing: , Fiberglass cloth made from texturized yarns, impregnated throughout with an inorganic fire retardant asbestos free adhesive; 20x14 thread count, 14.5 oz./sq.yd, 0.04 inch thickness, 1,000° F upper temperature limit; GLT Products "Style 1989" or approved equal.

2.5 INSULATION ACCESSORIES

- A. Adhesives: Waterproof and fire-retardant type.
- B. Canvas Lagging Adhesive: Fire resistive to NFPA 255.
- C. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.
- D. Joint Tape: Glass fiber cloth, open mesh.

- E. FSK Joint Tape; ASTM C1136 Foil-Scrim-Kraft (FSK) lamination coated with solvent acrylic pressure sensitive adhesive; capable of adhering to fibrous and sheet metal surfaces; tri-directionally reinforced 2x3 squares per inch fiberglass scrim; 9.5 mils thick, -40 to 240° F service temperatures; Venture Tape “1525CW” or approved equal.
- F. Tie Wire: Annealed steel, 16 gauge.
- G. Insulated pipe supports: Calcium silicate with galvanized steel jacket (min. 24 gauge); ANSI/ASTM C533; rigid white; 'k' value of 0.37 at 100° F, rated to 1,200° F; Thermal Pipe Shields “T-1000 Calsil” or equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install materials after piping has been tested and approved.
- B. Clean surfaces for adhesives.
- C. Prepare surfaces in accordance with manufacturer's recommendations.

3.2 INSTALLATION - PIPING

- A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
- B. Continue insulation vapor barrier through penetrations except where prohibited by code.
- C. Locate insulation and cover seams in least visible locations.
- D. Neatly finish insulation at supports, protrusions, and interruptions.
- E. Provide insulated cold pipes conveying fluids below ambient temperature with vapor retardant jackets with self-sealing laps. Insulate complete system, including under fitting jackets.
- F. For insulated pipes conveying fluids above ambient temperature, secure jackets with self-sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions. Insulate complete system, including under fitting jackets.
- G. Provide insert between support shield and piping on piping 1-½" inches diameter to 2" diameter. Prefabricated inserts of wood blocks, or other heavy density insulating material shall not be less than 10" long:
- H. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.

- I. Fully insulate all piping including all spaces under jacketing.
- J. Jackets:
 - 1. Indoor, Concealed Applications: Insulated pipes shall have vapor barrier jackets, factory-applied. Vapor barrier PVC fittings may also be used provided joints are sealed with solvent welding adhesive approved by the jacket manufacturer.
 - 2. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers or metal jacket.
 - 3. Insulate all exposed trap arms, drains, and hot water supplies for handicap protection on handicap accessible fixtures.

3.3 SCHEDULE - PIPING

PIPING	TYPE	PIPE SIZE Inch	MINIMUM INSULATION THICKNESS Inch
Domestic Cold Water	A, B, C, D	All Sizes	1"
Domestic Hot Water Supply – Mains	A, B, C, D	All Sizes	1"
Domestic Hot Water Supply – Branch Lines	A, B, C, D	All Sizes	1"
Domestic Hot Water Recirculating	A, B, C, D	All Sizes	1"
Vent Through Roof	A, B, C, D	All Sizes	1"
Handicap lavatories, sinks @ waste and supply	E	All Sizes	½"

END OF SECTION 22 07 00

SECTION 22 10 00

PLUMBING PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Sanitary Sewer Piping.
- B. Water Piping.
- C. Valves.
- D. Backflow Preventers.
- E. Water Hammer Arrestors.
- F. Dielectric Connections.
- G. Cleanouts.
- H. Trap Primer Valves.
- I. Thermostatic Mixing Valves.

1.2 RELATED WORK

- A. Section 22 05 00 – Common Work Results for Plumbing.
- B. Section 22 05 19 – Meters and Gages for Plumbing Piping.
- C. Section 22 07 00 - Plumbing Insulation.
- D. Section 22 10 19 - Plumbing Specialties.
- E. Section 22 30 00 - Plumbing Equipment.
- F. Section 22 40 00 - Plumbing Fixtures.

1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Any pipe or plumbing fitting or fixture, any solder, or any flux utilized on this project shall be “lead free” in accordance with the Safe Drinking Water Act, Section 1417. “Lead free”

materials utilized in domestic water system shall not contain more than 0.2 percent lead when used with respect to solder and flux; and not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures. All materials utilized in domestic water system shall be certified by an ANSI accredited organization to conform to ANSI/NSF Standard 61.

- C. Welding Materials and Procedures: Conform to ASME Code and applicable state labor regulations.
- D. Welders Certification: In accordance with ANSI/ASME Sec 9.

1.4 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include data on pipe materials, pipe fittings, valves and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 service weight. Fittings: Cast iron. Joints: Hub-and-spigot, CISPI HSN compression type with ASTM C564 neoprene gaskets.
- B. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
- C. Copper Tubing: ASTM B306, DWV. Fittings: ASME B16.3, cast bronze, or ASME B16.29, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813.

2.2 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight. Fittings: Cast iron. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies, Husky Series 4000 or approved equal.
- B. Copper Pipe: ASTM B306, DWV. Fittings: ASME B16.3, cast bronze, or ASME B16.29, wrought copper. Joints: ASTM B32, solder, Grade 95TA; Flux: ASTM B813, or Press-Fit.

- C. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded. Installation of ABS piping in return air plenums is prohibited.
- D. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.3 DOMESTIC WATER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Copper Tubing: ASTM B42, Type K, annealed. Fittings: ANSI/ASME B16.22, wrought copper. Joints: AWS A5.8, BCuP silver braze; Flux: ASTM B813.
- B. Ductile Iron Pipe: AWWA C151. Fittings: Ductile iron, standard thickness. Joints: AWWA C111, rubber gasket with $\frac{3}{4}$ inch diameter rods.
- C. PVC Pipe: AWWA C900.
- D. High Density Polyethylene Pipe: ASTM D 3350 HDPE designation code of PE 4710 or PE 3608. The material shall meet the requirements of and shall have a minimum cell classification of PE445474C for PE 4710 and PE345464C for PE 3608. In addition, the pipe shall be listed as meeting NSF-61 and AWWA C901. Fittings: ASTM D3261 Butt Fusion Fittings. ASTM F1055 Electrofusion Fittings. ASTM D 3261 Flanged and Mechanical Joint Adapters.

2.4 DOMESTIC WATER PIPING, ABOVE GRADE

- A. Copper Tubing: ASTM B88, Type L, hard drawn. Fittings: ASME B16.18, cast copper alloy, or ASME B16.22, wrought copper. Joints: ANSI/ASTM B32, solder, Grade 95TA; Flux: ASTM B813 or Press-Fit.
- B. Chlorinated Polyvinyl Chloride (CPVC) Piping:
 - 1. $\frac{1}{2}$ " To 2": FlowGuard Gold CPVC or equal, ASTM D2846, NSF listed, SDR 11, Schedule 40, Fittings: Solvent welded socket type.
 - 2. Larger than 2": Corzan CPVC or equal, ASTM F441, NSF listed, Schedule 80, Fittings: ASTM F439 Solvent welded socket type.
- C. Polypropylene (PP-R) Piping:
 - 1. Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water shall contain a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

2. Pipe shall be Aquatherm® Greenpipe®, or Greenpipe® Faser®, available from Aquatherm, Inc.. Piping specifications and ordering information are available at www.aquathermpipe.com.

- D. PEX Tubing: Tubing shall be cross-linked high-density polyethylene. Tubing shall be produced using saline method of cross-linking and shall meet the dimension and performance specifications of ASTM F876/F877 and CSA B137.5. Tubing shall also comply with ANSI/NSF 61 as suitable for use with potable water. Temperature and pressure ratings shall be 160 psi at 73 degrees F, 100 psi at 180 degrees F, and 80 psi at 200 degrees F.

2.5 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; 1/16 inch thick preformed neoprene bonded to fiber.
- C. Grooved and Shouldered Pipe End Couplings: Malleable iron housing clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; "C" shape composition sealing gasket; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
- D. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.6 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

- A. Apollo.
- B. FNW.
- C. Hammond.
- D. Milwaukee.
- E. Nibco.
- F. Substitutions: Under provisions of Division 01.

2.7 GLOBE VALVES

- A. Not permitted. Use ball or butterfly valves for throttling service.

2.8 BALL VALVES

- A. Up to 2 Inches: Bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, lever handle, solder, threaded or press-fit ends.

2.9 SWING CHECK VALVES

- A. Up to 2 Inches: Bronze swing disc, solder, screwed or press-fit ends.
- B. Over 2 Inches: Iron body, bronze trim, swing disc, renewable disc and seat, flanged, solder, threaded or press-fit ends.

2.10 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, spring loaded, renewable composition disc, wafer, flanged, solder, threaded or press-fit ends.

2.11 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches: Lead free cast copper silicon alloy, stainless steel and thermoplastic internal parts, reinforced EPDM diaphragm and valve disk, stainless steel strainer, NPT or solder ends. Watts Regulator LF123LP series or approved equal.

2.12 PRESSURE RELIEF VALVES

- A. Bronze body, Teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled, NPT ends.

2.13 BACKWATER VALVE

- A. Lacquered cast iron body, automatic bronze flapper valve, gasketed and bolted cover, backwater valve with no hub inlet and outlet.

2.14 BALANCE VALVE

- A. Straight pattern, calibrated balance valve for 400 psig maximum working pressure, with NSF 61 compliant lead free brass body, type 304 stainless steel ball, glass and carbon filled TFE seat rings, brass and EPT check valves, EPDM stem o-ring, plastic wheel handle for shut-off service, and lockshield key cap with set screw memory bonnet for balancing service. NPT or sweat ends. Bell & Gossett Circuit Setter Plus or approved equal.

2.15 ACCEPTABLE MANUFACTURERS - BACKFLOW PREVENTERS

- A. Watts Regulator.

- B. Febco.
- C. Colt.
- D. Substitutions: Under provisions of Division 01.

2.16 BACKFLOW PREVENTERS

- A. General: Backflow preventers shall conform to the applicable requirements of AWWA C510. Furnish a certificate of Full Approval or a current Certificate of Approval for each design, size, and make of backflow preventer being provided for the project. The certificate shall be from the Foundation for Cross- Connection Control and Hydraulic Research, University of Southern California, and shall attest that this design, size, and make of backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. A Certificate of Provisional Approval is not acceptable in lieu of the above. IAPMO (UPC) approved.
- B. Atmospheric Type Anti-Siphon Vacuum Breaker: ASSE Standard 1001, ANSI A112.1.1 and CSA B64 Lead free construction suitable for hot and cold water. Watts Regulator Series LF288A or approved equal.
- C. Boiler Dual Check Valve with Atmospheric Vent: The valve shall be constructed of stainless steel with rubber internals protected by an integral strainer. Primary check shall be rubber to rubber seated, backed by the secondary check with rubber to metal seating. The device shall be ASSE Std. 1012. Watts Regulator Series 9D or approved equal.
- D. Combination Boiler Fill Valve and Backflow Preventer: The combination valve shall contain a Boiler Dual Check Valve with Atmospheric Vent and a High Capacity Feed Water Pressure Regulators shall be constructed of an iron and bronze body construction with NPT threaded inlet and outlet connections, a tight seating check valve, purge lever for manual purging, and a stainless steel strainer. Maximum Pressure: 100 psi. Watts Regulator Series 1156F or approved equal.

2.17 ACCEPTABLE MANUFACTURERS - WATER HAMMER ARRESTORS

- A. J.R. Smith.
- B. Zurn.
- C. Mifab.
- D. Substitutions: Under provisions of Division 01.

2.18 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, pre-charged suitable for operation in temperature range -100°F to 300°F and maximum 250 psig working pressure; Series 5000 manufactured by J.R. Smith or approved equal.

2.19 ACCEPTABLE MANUFACTURERS - DIELECTRIC CONNECTIONS

- A. Elster Perfection - Clearflow.
- B. Substitutions: Under provisions of Division 01.

2.20 DIELECTRIC CONNECTIONS

- A. Dielectric Connections: ASTM standard F-1545 for continuous use at temperatures up to +225°F and for pressures up to 300 psi. IAPMO, UPC listed. Thread connections.

2.21 DRAIN VALVES

- A. Bronze body, chrome plated brass ball, RPTFE seals and stuffing box ring, stainless steel handle with vinyl cover. 3/4" NPT x 3/4" Hose thread, with duct cover and chain, sweat ends. Apollo 78-100 Series or approved equal.

2.22 ACCEPTABLE MANUFACTURERS - CLEANOUTS

- A. J.R. Smith.
- B. Zurn.
- C. Mifab.
- D. Substitutions: Under provisions of Division 01.

2.23 CLEANOUTS

- A. Exterior Surfaced Areas: Round cast iron access frame and non-skid cover, bronze plug, vandal resistant screws. J.R. Smith Model 4251 or approved equal.
- B. Interior Finished Floor Areas: Enamel paint coated cast iron, two piece body with double drainage flange, weep holes, reversible clamping collar, bronze plug, and adjustable round nickel bronze scoriated cover in service areas and round with depressed cover to accept floor finish in finished floor areas. J.R. Smith Model 4021 or approved equal.
- C. Interior Finished Wall Areas: Line type with lacquered cast iron body and round epoxy coated gasketed cover, bronze plug, and round stainless steel access cover secured with machine screw. J.R. Smith Model 4022 or approved equal.

- D. Interior Unfinished Accessible Areas: Caulked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

2.24 ACCEPTABLE MANUFACTURERS – TRAP PRIMER VALVES

- A. Precision Plumbing Products, Inc.
- B. Mifab.
- C. Zurn.
- D. Substitutions: Under provisions of Division 01.

2.25 ELECTRONIC TRAP PRIMER VALVE

- A. Electronic Trap Primer: Prime-time Trap Primer as manufactured by Precision Plumbing Products or equal. Surface mounted in NEMA-1 cabinet with cover plate. UL listed. Provide manifold with number of connections as indicated on the drawings. Precision Plumbing Products, Inc. Model PT or approved equal.

2.26 MANUAL TRAP PRIMER VALVE

- A. Valve: Machined of brass, containing no springs or diaphragms. “O” rings acceptable for –40°F to +450°F operation. Distribution Unit: Brass fitting with copper water reservoir. Clear plastic cover. Tappings for up to four drain taps. Precision Plumbing Model Prime-Rite or approved equal.

2.27 ACCEPTABLE MANUFACTURERS - MIXING VALVES

- A. Powers.
- B. Watts Regulator.
- C. Lawler Manufacturing Company.
- D. Symmons Industries Inc.
- E. Substitutions: Under provisions of Division 01.

2.28 MASTER TEMPERING VALVE

- A. Master water tempering valve shall be of the thermostatic type with liquid-filled motor. It shall have lead free bronze body construction with replaceable corrosion-resistant components. Valve construction shall employ sliding piston control mechanism. Piston and liner shall be of stainless steel material. Valve shall come equipped with removable union end stop and check inlets with stainless steel strainers. Valve shall control temperature from a low flow to the

maximum flow rate for a given pressure differential. Valve shall provide protection against hot or cold supply line failure and thermostat failure.

- B. Unit includes a dial thermometer and ball valve on tempered water outlet. Unit shall be provided assembled and tested with necessary fittings and nipples.

2.29 LAVATORY TEMPERING VALVE

- A. Lead free bronze construction, adjustable temperature selection with locknut to prevent tampering, thermal actuator, corrosion resistant internal component, integral checks with screen.
- B. Performance:
 - 1. Factory set to 105°F.
 - 2. Maximum Operating Pressure: 125psi.
 - 3. Maximum Hot Water Temperature: 180°F.
 - 4. Minimum Hot Water Supply Temperature: 5°F Above Set Point.
 - 5. Hot Water Inlet Temperature Range: 120°F – 180°F.
 - 6. Cold Water Inlet Temperature Range: 40°F – 80°F.
 - 7. Temperature Adjustment Range: 80°F – 120°F.
 - 8. Minimum Flow: 0.5 GPM.
 - 9. Listing: ASSE 1070, cUPC.
 - 10. Approval: CSA B125.3 Certified.
- C. Powers Series LFe480 or approved equal.

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. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Route piping in orderly manner and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.

- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Provide clearance for installation of insulation and access to valves and fittings.
- G. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- H. Slope water piping and arrange to drain at low points.
- I. Establish elevations of buried piping outside the building to ensure not less than 10 ft. of cover.
- J. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- K. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting. Refer to Division 09.
- L. Establish invert elevations, slopes for drainage to 1/4" per foot, 1/8" per foot if 4" or over, minimum. Maintain gradients.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with Teflon™ based thread lubricate. Ensure clearance at cleanout for rodding of drainage system.
- O. Encase exterior cleanouts in concrete flush with grade.
- P. Install water hammer arrestors complete with accessible isolation valve.

3.3 APPLICATION

- A. Install unions downstream of valves and at equipment connections.
- B. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- C. Install ball or balance valve valves for throttling, bypass, or manual flow control services. (No globe valves permitted.)
- D. Provide spring loaded check valves on discharge of water pumps.
- E. Use grooved mechanical couplings and fasteners only in accessible locations.

3.4 TESTING

- A. Test all water piping in accordance with Section 609 of the UPC. Submit a signed statement to the Engineer stating testing dates, procedure and initials of tester.

3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Flush, clean and disinfect the potable water system in accordance with Section 609 of the UPC. Submit a signed statement to the Engineer stating disinfection dates, procedure and initials of tester.

3.6 SERVICE CONNECTIONS

- A. Connect to exterior sanitary services, as required. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Connect to water service complete with reduced pressure backflow preventor and water meter with by-pass valves. Provide 18 gauge galvanized sheet metal sleeve around service main to 6 inch above floor. Size for minimum of 2 inches of loose batt insulation stuffing. Provide close fitting galvanized sheet metal escutcheon.

END OF SECTION 22 10 00

SECTION 22 30 00
PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Hot Water Generators.
- B. Expansion Tanks.
- C. Pumps.
- D. Elevator Sump Pumps.

1.2 RELATED WORK

- A. Division 02 - Excavating, Backfilling, Trenching.
- B. Section 22 05 00 – Common Work Results for Plumbing.
- C. Section 22 05 19 – Meters and Gages for Plumbing Piping.
- D. Section 22 07 00 - Plumbing Insulation.
- E. Section 22 40 00 - Plumbing Fixtures.

1.3 QUALITY ASSURANCE

- A. Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- B. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. National Sanitation Foundation (NSF).
 - 2. American Society of Mechanical Engineers (ASME).
 - 3. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - 4. National Electrical Manufacturers' Association (NEMA).
 - 5. Underwriters Laboratories (UL).
- C. 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.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME Section 8D for manufacture of pressure vessels for heat exchangers.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.
- C. Indicate pump type, capacity, materials of construction, power requirements, and affected adjacent construction.
- D. Submit certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
- E. Submit manufacturer's installation instructions under provisions of Division 01.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Provide temporary inlet and outlet caps. Maintain caps in Place until installation.

1.8 WARRANTY

- A. Provide manufacturer's warranty under provisions of Division 01.

PART 2 - PRODUCTS

2.1 HOT WATER GENERATORS

- A. Manufacturer's List:

1. Energy Kinetics.
2. Amtrol.
3. SuperStor.
4. Lochinvar.

- B. Pressure Shell: Type 316L stainless steel, for working pressure of minimum 125 psig, steel support, tapping's for accessories, threaded connections, 2" rigid polyurethane insulation.
- C. Heat Exchanger: Replaceable, high output cupronickel heat exchanger, double wall vented to atmosphere.
- D. Outer Jacket: Polyethylene.
- E. Temperature Control: Electro-mechanical Aquastat.
- F. Accessories: Tank drain, ASME pressure relief valve with extended probe suitable for maximum working pressure.

2.2 ACCEPTABLE MANUFACTURERS – DOMESTIC WATER THERMAL EXPANSION TANKS

- A. Amtrol.
- B. Taco.
- C. Armstrong.
- D. Bell & Gossett.
- E. Substitutions: Under provisions of Division 01.

2.3 DOMESTIC WATER THERMAL EXPANSION TANKS

- A. Construction: Welded steel, constructed, tested and stamped in accordance with Section VIII, Division 1 of the ASME Code for a working pressure of 125 PSIG; factory air pre-charged and field adjustable. All welds conforming to ASME Section IX. All internal parts must comply with FDA regulations and approvals.
- B. The tank shall be supported by steel legs or a base (integral ring mount) for a vertical installation.
- C. Each tank shall have a steel shell and an internal butyl/EPDM diaphragm or butyl bladder to isolate the air charge from fluid.
- D. Accessories: Pressure gauge and air-charging fitting, tank drain; precharge to incoming domestic water supply pressure.

2.4 ACCEPTABLE MANUFACTURERS - IN-LINE CIRCULATOR PUMPS

- A. Grundfos.
- B. Wilo.
- C. Taco.
- D. Substitutions: Under provisions of Division 01.

2.5 IN-LINE CIRCULATOR PUMPS

- A. Casing: Bronze, rated for 125 psig working pressure.
- B. Impeller: Bronze.
- C. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.
- D. Seal: Carbon rotating against a stationary ceramic seat.
- E. Drive: Flexible coupling.

2.6 ACCEPTABLE MANUFACTURERS – ELEVATOR SUMP PUMPS

- A. Liberty.
- B. Zoeller.
- C. Xylem.
- D. Substitutions: Under provisions of Division 01.

2.7 ELEVATOR SUMP PUMPS

- A. Operating Conditions: The manual pump is connected to a control which has the ability to prevent oil from being pumped from the elevator sump. This same control unit will activate an alarm when an oil "film" is detected or when a high water condition exists. The system will continue to monitor and remove water from the vault even if an oil condition is detected.
- B. Construction: The centrifugal sump pump shall be constructed of class 25 cast iron. The motor housing shall be oil filled to dissipate heat. All mating parts shall be machined and sealed with a Buna-N o-ring. All fasteners exposed to the liquid shall be stainless steel. The motor shall be protected on the top side with sealed cord entry plate with molded pins to conduct electricity eliminating the ability of water to enter internally through the cord. The motor shall be protected on the lower side with a unitized ceramic/carbon seal with stainless steel housings and spring or engineered double lip seal with stainless steel springs. The pump shall be furnished with stainless steel handle.

- C. Electrical Power Cord: The submersible pump shall be supplied with a 25 feet of multiconductor power cord. It shall be cord type YELLOW UL 16-3 SJEOOW 300V 105°C, capable of continued exposure to the pumped liquid. The power cord shall be sized for the rated full load amps of the pump in accordance with the National Electric Code. The power cable shall not enter the motor housing directly but will conduct electricity to the motor by means of a water tight compression fitting cord plate assembly, with molded pins to conduct electricity. This will eliminate the ability of water to enter internally through the cord, by means of a damaged or wicking cord.
- D. Motors: Single phase motors shall be oil filled, permanent split capacitor, Class B insulated NEMA B design, rated for continuous duty. At maximum load the winding temperature shall not exceed 130 degrees C unsubmerged. The pump motor shall have an integral thermal overload switch in the windings for protecting the motor. The capacitor circuit shall be mounted internally in the pump.
- E. Bearings and Shaft: An upper sleeve and lower ball bearing shall be required. The lower ball bearing shall be a single ball / race type bearing. Both bearings shall be permanently lubricated by the oil, which fills the motor housing. The motor shaft shall be made of 300 or 400 series stainless steel.
- F. Seals: The pump shall have a unitized carbon / ceramic seal with stainless steel housings and spring, or engineered double lip seal with stainless steel springs. The motor plate / housing interface shall be sealed with a Buna-N o-ring.
- G. Impeller: The impeller shall be vortex style made of an engineered polymer, with pump out vanes on the back shroud to keep debris away from the seal area. It shall be threaded to the motor shaft.
- H. Controls: The control unit has three probes and a float ball switch. The pump will activate when the middle probe contacts water, and will remain on until the first, longest probe no longer is in contact with water. A high water alarm is activated when third or shortest probe contacts water. The system will ignore a small film of oil, however larger volumes of oil will be detected when the alarm probe does not detect water and the float ball activates. The system will continue to operate, removing water not oil from the sump even when oil has been detected.
- I. Paint: The exterior of the casting shall be protected with powder coat paint.
- J. Testing: The pump shall have a ground continuity check and the motor chamber shall be Hi-potted to test for electrical integrity, moisture content and insulation defects. The motor and volute housing shall be pressurized, and an air leak decay test is performed to ensure integrity of the motor housing. The pump shall be run, voltage current monitored, and the tester checks for noise or other malfunction.

PART 3 - EXECUTION

3.1 HOT WATER GENERATOR INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions.
- B. Coordinate with plumbing piping and related electrical work to achieve operating system.

3.2 PUMP INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide line sized ball valve and strainer on suction and line sized soft seated check valve and globe valve on discharge.
- C. Ensure shaft length allows sump pumps to be located minimum 24 inches below lowest invert into sump pit and minimum 6 inches (150) clearance from bottom of sump pit.

END OF SECTION 22 30 00

SECTION 22 40 00
PLUMBING FIXTURES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Water Closets.
- B. Lavatories.
- C. Janitor Sinks.
- D. Drinking Fountains.
- E. Hose Bibbs.

1.2 RELATED WORK

- A. Section 22 05 00 - Common Work Results for Plumbing.
- B. Section 22 10 00 – Plumbing Piping.
- C. Section 22 30 00 – Plumbing Equipment.

1.3 REFERENCES

- A. ANSI/ASSE 1012 - Backflow Preventers with Immediate Atmospheric Vent.
- B. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- C. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- D. ANSI A112.21.1 - Floor Drains.

1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Trim: By same manufacturer for each product specified throughout.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include sizes, rough-in requirements, service sizes, and finishes.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include fixture trim exploded view and replacement parts lists.
- C. Provide Manufacturer's parts list and maintenance information on specialties.

1.7 WARRANTY

- A. Provide manufacturer's warranty under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS –FIXTURES

- A. Kohler.
- B. American Standard.
- C. Just.
- D. Elkay.
- E. Fiat.
- F. Substitutions: Under provisions of Division 01.

2.2 ACCEPTABLE MANUFACTURERS - FLUSH VALVES

- A. Sloan.
- B. Zurn.
- C. Delaney.
- D. Substitutions: Under provisions of Division 01.

2.3 ACCEPTABLE MANUFACTURERS - WATER CLOSET SEATS

- A. Kohler.
- B. American Standard.
- C. Bemis.
- D. Substitutions: Under provisions of Division 01.

2.4 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

- A. J.R. Smith.
- B. Zurn.
- C. Mifab.
- D. Substitutions: Under provisions of Division 01.

2.5 ACCEPTABLE MANUFACTURERS -FIXTURE TRIM

- A. Delta.
- B. Moen.
- C. Chicago.
- D. Just.
- E. Fiat.
- F. Substitutions: Under provisions of Division 01.

2.6 WATER CLOSET, ADA

- A. Bowl: ANSI A112.19.2M; floor mount, 1.28 GPF, elongated vitreous china bowl, floor outlet with 2-1/4 inch passageway and 1-1/2 inch top spud.
- B. Manual Flush Valve: ANSI A112.18.1; exposed chrome plated, diaphragm type with oscillating handle, escutcheon, seat bumper, integral screwdriver stop and vacuum breaker, 1.28 gallon flush.
- C. Seat: Solid white plastic, anti-microbial agent, elongated open front, extended back, check hinge, brass bolts, without cover.

2.7 LAVATORY - COUNTER

- A. Lavatory: ANSI A112.19.2M; vitreous china self-rimming countertop lavatory, 20-1/4 x 17-1/2 inch oval with faucet drillings on 4 inch centers, front overflow, seal of putty, caulking, or concealed vinyl gasket.
- B. Trim: ANSI A112.18.1; Lead free, ADA, chrome plated brass, single handle deck mounted faucet, 0.5 GPM vandal resistant aerator, metal grid strainer.

2.8 LAVATORY – WALL

- A. Lavatory: ANSI A112.19.2M; vitreous china self-rimming countertop lavatory, 20-1/4 x 17-1/2 inch oval with faucet drillings on 4 inch centers, front overflow, seal of putty, caulking, or concealed vinyl gasket.
- B. Trim: ANSI A112.18.1; Lead free, ADA, chrome plated brass, single handle deck mounted faucet, 0.5 GPM vandal resistant aerator, metal grid strainer.

2.9 JANITOR SINK

- A. Sink: 24 x 24 x 10 inch high heat molded resin basin, floor mounted, with one inch wide shoulders, combination dome strainer and stainless steel lint basket.
- B. Trim: ANSI A112.18.1; chrome plated, exposed wall type faucet with, vacuum breaker, integral stops, adjustable wall brace, pail hook and 3/4 inch hose thread on spout. Body inlets on 8 inch centers, four arm handles. 2-1/2 feet of 1/2 inch diameter plain end reinforced plastic hose, wall mounted stainless steel hose clamp, three position stainless steel mop hanger.

2.10 DRINKING FOUNTAIN

- A. Fountain: ANSI/NSF Std.61/9; Wall-mounted, one-piece, barrier-free, wall mounted, 14 gauge Type 304 stainless steel receptor with No. 4 satin finish, forged lead-free polished chrome brass bubbler, brass waste strainer, adjustable self-regulating push button valve, vandal resistant bottom plate, 1-1/4" IPS trap, wall mounting plate, cane skirt.

2.11 P-TRAP

- A. P-trap shall be chrome plated cast brass body, with 17 gauge seamless tubular wall bend, cast brass slip nuts. Reducing washers shall be used with reducing cast brass nut, chrome plated brass escutcheons.

2.12 ANGLE STOPS AND SUPPLY RISERS

- A. Quarter-turn lead free brass ball valve with convertible loose key handle, chrome plated copper, or braided stainless supply risers and chrome plated brass escutcheons.

2.13 ACCEPTABLE MANUFACTURERS - FLOOR DRAINS AND ACCESSORIES

- A. J.R. Smith.
- B. Zurn.
- C. Josam.
- D. Mifab.
- E. Substitutions: Under provisions of Division 01.

2.14 FLOOR DRAINS

- A. FD-1: ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer and trap primer connection as indicated; Model 2005-A manufactured by J.R. Smith.

2.15 ACCEPTABLE MANUFACTURERS - HOSE BIBBS/HYDRANTS

- A. Woodford.
- B. J.R. Smith.
- C. Zurn.
- D. Josam.
- E. Mifab.
- F. Substitutions: Under provisions of Division 01.

2.16 HOSE BIBBS/HYDRANTS

- A. Exterior Hose Bibb: ANSI/ASSE 1019; non-freeze, self-draining type with chrome plated hose thread spout, removable key, and vacuum breaker in conformance with ANSI/ASSE 1011;

2.17 TRAP PRIMER VALVE

- A. Valve: Machined of brass, containing no springs or diaphragms. "O" rings acceptable for -40 to +450 F operation.
- B. Distribution Unit: Brass fitting with copper water reservoir. Clear plastic cover. Tappings for up to four drain taps.
- C. Prime-Rite Trap Primer as manufactured by Precision Plumbing Products or equal.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate cutting of roof floor construction to receive drains to required invert elevations.

3.2 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.
- B. Verify adjacent construction is ready to receive rough-in work of this Section.

3.3 INSTALLATION

- A. Install each fixture with removable p-trap for servicing and cleaning.
- B. Provide angle stop and supply risers at each fixture. Provide chrome plated escutcheons for both hot and cold water supplies and waste piping.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall or floor carriers, supports as per the manufacturer's instructions.
- E. Solidly attach floor mounted water closets to toilet flange with non-corroding t-bolts, washers and acorn nuts.
- F. Seal fixtures to wall and floor surfaces with silicone sealant, color to match fixture.
- G. Mount fixtures above finished floor in accordance with Architectural.
- H. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- I. 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.
- J. Encase exterior cleanouts in concrete flush with grade.
- K. Install water hammer arrestors complete with accessible isolation valve.

3.4 ADJUSTING AND CLEANING

- A. Adjust stops, valves or flow control valves for intended water flow rate to fixtures without splashing, noise, or overflow.
- B. Remove and clean all aerators and filters from faucets and other plumbing fixtures after the domestic water system has been tested, flushed and disinfected as per Section 22 05 00.
- C. At completion remove all visible stickers and tags not intended to be left in place, thoroughly clean all surfaces of plumbing fixtures.

END OF SECTION 22 40 00

SECTION 23 05 00

COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

- A. All provisions of the Contract including the General and Supplementary Conditions and the General Requirements apply to this work.

1.2 WORK INCLUDED

- A. The work to be included in these and all other mechanical subsections shall consist of providing, installing, adjusting and setting into proper operation complete and workable systems for all items shown on the drawings, described in the specifications or reasonably implied. This shall include the planning and supervision to coordinate the work with other crafts and to maintain a proper time schedule for delivery of materials and installation of the work.
- B. Division 01 of the specifications is to be specifically included as well as all related drawings.

1.3 RELATED WORK

- A. Related Work Specified Elsewhere:
 - 1. Electrical Specifications: Division 26.
 - 2. Motors and Connections: Division 26.
 - 3. Starters and Disconnects: Division 26.
- B. Unless otherwise indicated on the electrical drawings or the electrical schedules, provide all mechanical equipment motors, motor starters, thermal overload switches, control relays, time clocks, thermostats, motor operated valves, float controls, damper motors, electric switches, electrical components, wiring and any other miscellaneous Division 23 controls. Disconnect switches are included in the electrical work, unless specifically called out on mechanical plans.
- C. Carefully coordinate all work with the electrical work shown and specified elsewhere.

1.4 REFERENCED CODES - LATEST ADOPTED EDITION

- A. NFPA 13 Installation of Sprinkler Systems.
- B. NFPA 70 National Electrical Code (NEC).
- C. IMC International Mechanical Code.

- D. UPC Uniform Plumbing Code.
- E. IECC International Energy Conservation Code.
- F. IFC International Fire Code.
- G. IBC International Building Code.

1.5 PROJECT RECORD DRAWINGS

- A. In addition to other requirements of Division 01, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all mechanical work which will become permanently concealed. Show routing of work in concealed blind spaces within the building. Show exact dimensions of buried piping off of columns or exterior walls.
- B. Maintain record documents at job site in a clean, dry and legible condition. Keep record documents available for inspection by the Project Manager.
- C. Show the location of all valves and their appropriate tag identification.
- D. At completion of project, deliver these drawings to the NPS Contracting Officer and obtain a written receipt.

1.6 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.
- B. Submit by specification section complete and all at one time; partial submittals will not be considered. Submittals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories in order of the Specification Sections. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications.
- C. Catalog sheets shall be complete and the item or model to be used shall be clearly marked, and identified as to which item in the specifications or on the drawings is being submitted and with drawing fixture number where applicable.
- D. Only submit on items specifically required by each specification section. If a submittal has not been requested, it will not be reviewed.
- E. Submit product data for:
 - 1. Hangers and Supports for HVAC Piping and Equipment.
 - 2. Vibration and Seismic controls for HVAC Piping, Ductwork and Equipment.
 - 3. Identification for HVAC Piping, Ductwork and Equipment.
- F. Provide shop drawings with calculations for selection of seismic/wind restraints in accordance with IBC and ASCE 7, certified by a qualified professional engineer, licensed in the State of

Alaska. Seismic calculations shall be based upon Seismic Category indicated in the structural documents. Components shall utilize an IP of 1.0 for seismic calculations.

1.7 OPERATING AND MAINTENANCE MANUALS

- A. Submit maintenance manuals to the Engineer covering all equipment, devices, etc. installed by the Contractor.
- B. The operation and maintenance manuals shall be submitted by specification section complete and all at one time; partial operations and maintenance manual submittals will not be considered. The Operation and maintenance manuals shall be provided in electronic PDF Format. The data in the electronic file shall be arranged and indexed under basic categories. An index shall be included with bookmarks and identifying tabs between sections and references to sections of specifications. The manual shall contain, but not limited to, the following types of information:
 - 1. Cover sheet with name, address, telephone number of Contractor, General Contractor and major equipment suppliers.
 - 2. Catalog cuts of all equipment, etc. installed (Marked to identify the specific items used).
 - 3. Manufacturer's maintenance and overhaul instruction booklets including exploded views.
 - 4. Identification numbers of all parts and nearest sources for obtaining parts and services.
 - 5. Reduced scale drawings of the control system and a verbal description of how these controls operate.
 - 6. A copy of the final test and balance report.
 - 7. A copy of valve schedule and reduced scale drawings showing valve locations.
 - 8. Written summary of instructions to Government.
 - 9. All manufacturers' warranties and guarantees.
 - 10. Contractors Warranty Letter.
- C. A periodic maintenance form that includes all of the equipment shall be provided with the maintenance manual. The form shall list each piece of equipment and how often maintenance is required (daily, weekly, monthly, annually). Opposite each task shall be squares for check-off for a full year (initials) to verify that the tasks are being done.

1.8 HANDLING

- A. See General Conditions and the General Requirements in Division 01 regarding material handling.
- B. Deliver packaged materials to job site in unbroken packages with manufacturer's label, and store to facilitate inspection and installation sequence. All items must be labeled and identified as to make, size and quality.

1.9 SUBSTITUTIONS

- A. See General Conditions and the General Requirements in Division 01 for substitution request procedures.

- B. In accordance with the General Conditions and the General Requirements in Division 01, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment. The NPS Contracting Officer shall be the final authority regarding acceptability of substitutes.

1.10 DIMENSIONS

- A. Before ordering any material or doing any work, the Contractor shall verify all dimensions, including elevations, and shall be responsible for the correctness of the same. No extra charge or compensation will be allowed on account of differences between actual dimensions and measurements indicated on the drawings.
- B. Any differences, which may be found, shall be submitted to the NPS Contracting Officer for consideration before proceeding with the work.

1.11 MANUFACTURER'S DIRECTIONS

- A. All manufactured articles shall be applied, installed and handled as recommended by the manufacturer, unless specifically called out otherwise. Advise the Architect/Engineer of any such conflicts before installation.

1.12 PERMITS, FEES, ETC.

- A. The Contractor under each Division of these specifications shall arrange for a permit from the local authority. The Contractor shall pay for any inspection fees or other fees and charges required by ordinance, law, codes and these specifications.

1.13 TESTING

- A. The Contractor under each section shall at his own expenses perform the various tests as specified and required by the Architect and as required by applicable code, the State and local authorities. The Contractor shall furnish all fuel and materials necessary for making tests.

1.14 TERMINOLOGY

- A. Whenever the words "furnish", "provide", "furnish and install", "provide and install", and/or similar phrases occur, it is the intent that the materials and equipment described be furnished, installed and connected under this Division of the Specifications, complete for operation unless specifically noted to the contrary.
- B. Where a material is described in detail, listed by catalogue number or otherwise called for, it shall be the Contractor's responsibility to furnish and install the material.
- C. The use of the word "shall" conveys a mandatory condition to the contract.

- D. "This section" refers to the section in which the statement occurs.
- E. "The project" includes all work in progress during the construction period.
- F. In describing the various items of equipment, in general, each item will be described singularly, even though there may be a multiplicity of identical or similar items.

1.15 SCHEDULE OF WORK

- A. The work under the various sections must be expedited and close coordination will be required in executing the work. The various trades shall perform their portion of the work at such times as directed so as to meeting scheduled completion dates, and to avoid delaying any other trade. The Architect will set up completion dates. Each contractor shall cooperate in establishing these times and locations and shall process his work so as to ensure the proper execution of it.

1.16 COOPERATION AND CLEANING UP

- A. The contractor for the work under each section of the specifications shall coordinate his work with the work described in all other sections of the specifications to the end that, as a whole, the job shall be a finished one of its kind, and shall carry on his work in such a manner that none of the work under any section of these specifications shall be handicapped, hindered or delayed at any time.
- B. At all times during the progress of the work, the Contractor shall keep the premises clean and free of unnecessary materials and debris. The Contractor shall, on direction at any time from the Architect, clear any designated areas or area of materials and debris. On completion of any portion of the work, the Contractor shall remove from the premises all tools and machinery and all debris occasioned by the work, leaving the premises free of all obstructions and hindrances.

1.17 WARRANTY

- A. Unless a longer warranty is hereinafter called for, all work, materials and equipment items shall be warrantied for a period of one year after acceptance by the Government. All defects in labor and materials occurring during this period, as determined by the Architect/Engineer, shall be repaired and/or replaced to the complete satisfaction of the Architect/Engineer. Guarantee shall be in accordance with Division 01.

1.18 COMPLETION REQUIREMENTS

- A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:
 - 1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
 - 2. Contractors One Year Warranty.
 - 3. All Manufacturers' Guarantees.

4. Test and Balance Reports.
5. Operation and Maintenance Manuals.

1.19 INSPECTION OF SITE - REMODEL PROJECTS

- A. The accompanying plans do not indicate completely the existing mechanical installations. The bidders for the work under these sections of the specifications shall inspect the existing installations and thoroughly acquaint themselves with conditions to be met and the work to be accomplished in removing and modifying the existing work, and in installing the new work in the present building and underground serving to and from that structure. Failure to comply with this shall not constitute grounds for any additional payments in connection with removing or modifying any part of the existing installations and/or installing any new work.

1.20 RELOCATION OF EXISTING INSTALLATIONS

- A. There are portions of the existing mechanical systems, and electrical systems, which shall remain in use to serve the finished building in conjunction with the indicated new installations. By actual examination at the site, each bidder shall determine those portions of the remaining present installations, which must be relocated to avoid interference with the installations of new work of his particular trade and that of all other trades. All such existing installations, which interfere with new installations, shall be relocated by the Contractor.

1.21 SALVAGE MATERIALS

- A. The Contractor shall remove existing equipment, duct, grilles and other items associated with the mechanical systems where no longer required for the project. Where such items are exposed to view or uncovered by any cutting or removal of general construction and has no continuing function (as determined by the Architect/Engineer), they shall be removed.
- B. All items or materials demolished from the project shall be Contractor's salvage and shall be removed from the site.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All equipment shall be regularly cataloged items of the manufacturer and shall be supplied as a complete unit in accordance with the manufacturer's standard specifications along with any optional items required for proper installation unless otherwise noted. Maintain manufacturer's identification, model number, etc. on all equipment at all times.
- B. Where more than one of an item is to be provided, all of the items shall be identical manufacture, make, model, color, etc.

2.2 RESTRICTED MATERIALS

- A. No materials containing asbestos in any form shall be allowed.
- B. No solder or flux containing lead shall be used on this project.
- C. Where materials or equipment provided by this Contractor are found to contain restricted materials, such items shall be removed and replaced with non-restricted materials items. Entire cost of restricted materials removal and disposal and cost of installing new items shall be the responsibility of the Contractor for those restricted materials containing items installed by the Contractor.

2.3 ELECTRICAL MOTORS

- A. Motors: Furnish electric motors designed for the specific application and duty applied, and to deliver rated horsepower without exceeding temperature ratings when operated on power systems with a combined variation in voltage and frequency not more than + 10% of rated voltage. Motors for pumps and fans shall be selected to be non-overloading.
- B. Verify from the drawings and specifications the available electrical supply characteristics and furnish equipment that will perform satisfactorily under the conditions shown and specified.
- C. All motors for use with equipment with variable frequency drives shall be inverter ready motors. Verify compatibility and sizing of motor with variable frequency drive.
- D. Size motors for 1.15 service factor and not to exceed 40° C temperature rise above ambient.
- E. Fractional horsepower motors to have self-resetting thermal overload switch.
- F. Provide Premium Efficiency, motors for all three phase motors one horsepower and larger. Standard efficiency motors will not be acceptable.

2.4 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

- A. Plastic Nameplates: Laminated plastic with engraved letters.
- B. Plastic Tags: Laminated plastic with engraved letters, minimum 1-1/2 inches diameter.
- C. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering.
- D. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- E. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, for direct burial service.

2.5 PIPE HANGERS AND SUPPORTS

- A. Conform to ANSI/MSS SP58.
- B. Hangers for Pipe Sizes ½ to 1-½ Inch: Malleable iron, adjustable swivel, split ring for steel pipe, copper swivel for copper pipe.
- C. Hangers for Hot Pipe Sizes 2 to 4 Inches and Cold Pipe Sizes 2 Inches and Larger: Carbon steel, adjustable, clevis.
- D. Wall Support for Pipe Sizes to 3 Inches: Strut triangular bracket with pipe clamp and cushion insulator.
- E. Vertical Support: Steel riser clamp.
- F. Floor Support for Pipe Sizes to 4 Inches and All Cold Pipe Sizes: Cast iron adjustable pipe saddle, locknut nipple, floor flange or steel support.
- G. Copper Pipe Support: Carbon steel ring, adjustable, copper plated with felt isolation pad or all copper ring or swivel.
- H. Shield for Insulated Piping 2 Inches and Larger: Hard block calcium silicate insert in 180° segments, 12 inch minimum length, block thickness same as insulation thickness, flame resistant vapor barrier covering and 18 gauge galvanized shield.
- I. Shield for Insulated Piping 1-½ Inches and Smaller: 18 gauge galvanized steel shield, over insulation in 180° segments, minimum 12 inches long at pipe support.
- J. Design hangers to allow installation without disengagement of supported pipe.
- K. Copper Plating: All hanger elements in metal-to-metal contact with copper pipe, except hanger rings with factory-applied 1/16 inch minimum thick plastic or tape cushion strip over all contact surfaces.
- L. Strut Type Pipe Hanging System: Unistrut P-1000 series; framing members shall be No. 12 gage formed steel channels, 1-5/8 inch square, conforming to ASTM A 570 GR33, one side of channel shall have a continuous slot with inturned lips; framing nut with grooves and spring 1/2 inch size, conforming to ASTM 675 GR60; screws conforming to ASTM A 307; fittings conforming to ASTM A 575; all parts enamel painted or electro-galvanized.

2.6 HANGER RODS

- A. Steel Hanger Rods: Threaded both ends, or continuous threaded.

2.7 ANCHOR BOLTS

- A. Anchor (Expansion) Bolts: Shall be carbon steel to ASTM A 307; nut shall conform to ASTM A194; shall be drilled-in type. Design values for shear and tension shall be not more than 80 percent of the allowable load.

2.8 INSERTS

- A. Inserts: Malleable iron case of steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.9 FLASHING

- A. Metal Flashing: 26-gauge minimum galvanized steel.
- B. Metal Counter Flashing: 22 gauge minimum galvanized steel.
- C. Flexible Flashing: 47-mil thick sheet butyl, compatible with roofing.
- D. Caps: Steel, 22-gauge minimum; 16 gauge at fire resistant elements.

2.10 EQUIPMENT CURBS

- A. Fabricate curbs of concrete or steel beam, unless specifically called out otherwise.

2.11 SLEEVES

- A. Sleeves for Pipes Through Non-fire Rated Floors: Form with 18 gauge galvanized steel for 4 inch diameter, 22 gauge up to 3" diameter.
- B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Form with steel pipe or 18 gauge galvanized steel for 4 inch diameter, 22 gauge up to 3" diameter.
- C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fireproofing: Prefabricated fire rated sleeves including seals, or UL listed caulking system.
- D. Fire Stopping Insulation: Mineral fiber type, non- combustible.
- E. Caulk: Fire stop sealant in compliance with ASTM E814, UL 1479 and Division 07.
- F. Mechanical Sleeve Seals: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.12 ACCEPTABLE MANUFACTURERS: VIBRATION ISOLATORS AND SEISMIC RESTRAINT

- A. Vibration isolators and Seismic Restraint shall be manufactured by:
 - 1. Amber/Booth.
 - 2. Cooper Industries.
 - 3. International Seismic Application Technology.
 - 4. Kinetics Noise Control.
 - 5. Mason Industries.
 - 6. Vibro-Acoustics
- B. Substitutions: Items of same function and performance are acceptable in conformance with Division 01.

2.13 VIBRATION ISOLATORS (ROTATING EQUIPMENT EXCEPT FANS)

- A. Floor Mount: Closed spring mount with iso-stiff springs and limit stop for seismic restraint. Isolators are to be sized and selected by equipment manufacturer.
- B. Hangers: Closed spring hanger with acoustic isolator.
- C. Provide pairs of neoprene side snubbers or restraining springs where side torque or thrust may develop.
- D. Color code spring mounts, spring selected to operate at no greater than 2/3 solid deflection and have ¼" ribbed neoprene pads.

2.14 FAN ISOLATION

- A. Provide spring type isolators for fans and heating and ventilation units.
- B. Spring isolators shall be free standing and laterally stable without any housing and complete with a molded neoprene cup or ¼ inch neoprene acoustical friction pad between the baseplate and the support. All mountings shall have leveling bolts that must be rigidly bolted to the equipment. Spring diameters shall be not less than 0.8 of the compressed height of the spring at rated load. Springs shall have a minimum additional travel to solid equal to 50% of the rated deflection.
- C. Seismically restrained spring isolators shall be as described above, built into a ductile iron or steel housing to provide all directional seismic snubbing. The snubber shall be adjustable vertically and allow a maximum of ¼ inch travel in all directions before contacting the resilient snubbing collars. Mountings shall be SSLFH as manufactured by Mason Industries.
- D. Cabinet unit heaters, panel fans, and other ventilation units mounted to solid ductwork or structure shall be internally factory isolated.

2.15 VENTILATING SYSTEMS FLEXIBLE CONNECTIONS

- A. Fabricate of neoprene coated flameproof fabric a minimum of 2" wide [3" wide for fan connectors] tightly crimped into metal edging strip and attach to ducting and equipment by screws or bolts at 6" intervals. DuroDyne Dynalon treated duct material, or equal. Durolon or equal for outdoor or high pressure applications.

2.16 LIMITS OF VIBRATION

- A. The factory is to statically and dynamically balance all rotating machinery, fans and pumps, etc. Do dynamic balancing at the operating speed of the motor.
- B. Select isolated equipment in accordance with the weight distribution, to produce uniform deflection on the vibration mounts. Deflection of vibration mounts shall be required to produce 95% vibration isolation efficiency, based on the equipment HP, rpm, location in regard to critical spaces and stiffness of the building supporting structural members, supporting the equipment.
- C. For fan-motor units in which the impeller is supported by the motor shaft, the motor and impeller shall be dynamically balanced as an integral unit.

2.17 EARTHQUAKE BUMPERS AND SNUBBERS

- A. Bumpers:
 - 1. Fabricate the bumper cradle of 6 X 4 X 3/8" angle iron minimum and provide with at least two holes for bolting to the floor.
 - 2. Attach one or more elastomeric mountings to pad the 6" leg of the angle iron.
 - 3. Design the mounting to deflect not more than 3/4" under the shock loading of 1 g in any direction in the horizontal plane.
 - 4. Manufacturer: Vibration Mounting Series "SR" seismic restraints, or similar.
- B. Snubbers:
 - 1. Interlocking steel members restrained by shock absorbent rubber materials.
 - 2. Elastomeric materials shall be replaceable and a minimum of 3/4" thickness.
 - 3. Maintain 1/8" air gap in all directions in design of snubber.
 - 4. Acceleration of 4 g's in any direction.
 - 5. All-directional restraint.
 - 6. Manufacturer: Mason Industries Z-1011 Seismic Snubber.

2.18 SEISMIC BRACING AND SUPPORT OF SYSTEMS AND COMPONENTS

- A. General:
 - 1. Seismic restraint designer shall coordinate all attachments with the structural engineer of record.

2. Design analysis shall include calculated dead loads, static seismic loads, and capacity of materials utilized for the connection of the equipment or system to the structure.
3. Analysis shall detail anchoring methods, bolt diameter, and embedment depth.
4. All seismic restraint devices shall be designed to accept without failure the forces calculated per the applicable building code and as summarized in installation requirements.
5. The total height of the structure (h) and the height of the system to be restrained within the structure (z) shall be determined in coordination with architectural plans and the General Contractor.

B. Friction from gravity loads shall not be considered resistance to seismic forces.

2.19 SEISMIC BRACING COMPONENTS

- A. Steel strut shall be 1-5/8 wide in varying heights and mig-welded combinations as required to meet load capacities and designs indicated. A material heat code, part number, and manufacturer's name shall be stamped on all strut and fittings to maintain traceability to material test reports.
1. Material for epoxy painted strut: ASTM A1011, SS, Grade 33.
 2. Material for pre-galvanized strut: ASTM A653, SS, Gr. 33.
 3. Material for Hot-Dip Galvanized strut: ASTM A1011, SS, Grade 33 and hot-dip galvanized after fabrication in accordance with ASTM A123.
 4. Material for fittings and accessories: ASTM A907 Gr. 33, Structural Quality or ASTM A1011, SS, Gr.33.
 5. Fittings and accessories: Products shall be of the same manufacturer as strut and designed for use with that product.

PART 3 - EXECUTION

3.1 DRAWINGS

- A. The drawings are partly diagrammatic, not necessarily showing all offsets or exact locations of piping and ducts, unless specifically dimensioned. The contractor shall provide all materials and labor necessary for a complete and operable system. Complete details of the building which affect the mechanical installation may not be shown. For additional details, see Architectural, Structural, Civil and Electrical Drawings. Coordinate work under this section with that of all related trades.

3.2 INSTALLATION

- A. All work shall comply with the latest adopted applicable codes and ordinances including, but not limited to, the IMC, UPC, IBC, NFPA, IECC, and IFC Standards; all local and state amendments to all codes and standards.
- B. Obtain and pay for all inspection fees, connection charges and permits as a part of the Contract.

- C. Compliance with codes and ordinances shall be at the Contractor's expense.

3.3 MEASUREMENTS

- A. Verify all measurements on the job site.
- B. Locate all equipment on the centers of walls, openings, spaces, etc., unless specified otherwise.
- C. Check all piping, ducts, etc. to clear openings.
- D. Rough-in dimensions shall be per manufacturer's recommendations and in compliance with current ADA and ANSI 117.1 standards.

3.4 OPERATING INSTRUCTIONS

- A. Before the facility is turned over to the Government, instruct the Government or Government's personnel in the operation, care and maintenance of all systems and equipment under the jurisdiction of the Mechanical Division. These instructions shall also be included in a written summary in the Operating Maintenance Manuals.
- B. The Operation and Maintenance Manuals shall be utilized for the basis of the instruction. Provide a minimum of eight hours of on-site instruction to the Government designated personnel.
- C. When required by individual specification sections provide additional training on HVAC systems and equipment as indicated in the respective specification section.
- D. Provide schedule for training activities for review prior to start of training.

3.5 SYSTEM ADJUSTING

- A. Each part of each system shall be adjusted and readjusted as necessary to ensure proper functioning of all controls, proper air distribution, elimination of drafts, noise and vibration.
- B. Balance air and water systems for volume quantities shown and as required to ensure even temperature and the elimination of drafts. Balancing shall be done by a qualified firm acceptable to the Engineer. Provide balancing log to the Engineer before substantial completion.

3.6 CUTTING, FITTING, REPAIRING, PATCHING AND FINISHING

- A. Arrange and pay for all cutting, fitting, repairing, patching and finishing of work by other trades where it is necessary to disturb such work to permit installation of mechanical work. Perform work only with craftsmen skilled in their respective trades.

- B. Avoid cutting, insofar as possible, by setting sleeves, frames, etc. and by requesting openings in advance. Assist other trades in securing correct location and placement of rough-frames, sleeves, openings, etc. for ducts and piping.
- C. Cut all holes neatly and as small as possible to admit work. Include cutting where sleeves or openings have been omitted. Perform cutting in a manner so as not to weaken walls, partitions or floors. Drill holes required to be cut in floors without breaking out around holes.

3.7 PAINTING

- A. Perform all of the following painting in accordance with provisions of Division 09 with colors as selected by the Architect. Provide the following items as a part of mechanical work:
 - 1. Factory applied prime and finish coats on mechanical equipment.
 - 2. Factory applied prime and finish coat on all air registers, grilles and diffusers, unless otherwise specified.
 - 3. Factory applied prime coat on access doors.
 - 4. Pipe identification where specified.
- B. If factory finish on any equipment furnished is damaged in shipment or during construction, refinish to equal original factory finish.

3.8 IDENTIFICATION

- A. Tag all valves with heat resistant laminated plastic labels or brass tags engraved with readily legible letters. Securely fasten to the valve stem or bonnet with beaded chain. Provide a framed, typewritten directory under glass, and installed where directed. Provide complete record drawings that show all valves with their appropriate label. Seton 250-BL-G, or 2961.20-G, 2" round or equal.
- B. Label all equipment with heat resistant laminated plastic labels having engraved lettering ½" high. If items are not specifically listed on the schedules, consult the Engineer concerning designation to use. Seton engraved Seton-Ply nameplates or equal.
- C. Identify piping to indicate contents and flow direction of each pipe exposed to view by a labeled sleeve in letters readable from floor at least once in each room and at intervals of not more than 20' apart and on each side of partition penetrations. Coloring scheme in accordance with ANSI A13.1-1981, Seton Opti-Code or equal.

3.9 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as follows:

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
½ to 1-¼ inch	6'-0"	3/8"
1-½ to 2 inch	10'-0"	3/8"

PIPE SIZE	MAX. HANGER SPACING	HANGER DIAMETER
2-½ o 3 inch	10'-0"	½"
4 inch	10'-0"	5/8"
PVC (All Sizes)	4'-0"	3/8"

- B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
- C. Place a hanger within 12 inches of each horizontal elbow.
- D. Use hangers with 1-½ inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide transverse seismic support for all piping systems.

3.10 INSERTS

- A. Provide inserts for placement in concrete formwork.

3.11 EQUIPMENT BASES AND SUPPORTS

- A. Provide equipment bases of concrete type where shown on plans.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct support of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.
- E. Anchor (Expansion) Bolts: Install anchor bolts for all mechanical equipment, piping and ductwork as required. Tightly fit and clamp base-supported equipment anchor bolts at all equipment support points. Provide locknuts where equipment, piping, and ductwork is hung. Install anchor (expansion) bolts in holes drilled in concrete where necessary to hang piping or ductwork, or to anchor stationary equipment from existing concrete slabs.

3.12 FLASHING

- A. Provide flexible flashing and metal counter-flashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent pipes projecting 3 inches minimum above finished roof surface with pre-manufactured butyl boot.
- C. Seal floor drains watertight to adjacent materials.

3.13 SLEEVES

- A. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- B. Set sleeves in position in construction. Provide reinforcing around sleeves.
- C. Extend sleeves through floors one inch above finished floor level. Caulk sleeves full depth and provide floor plate.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, install sleeve, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk seal. Use fire rated caulking where fire rated walls are penetrated. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.14 SCOPE OF VIBRATION ISOLATION WORK

- A. All vibrating equipment and the interconnecting pipe shall be isolated to eliminate the transmission of objectionable noise and vibration from the structure.
- B. HVAC equipment shall be carefully checked upon delivery for proper mechanical performance, which shall include proper noise and vibration operation.
- C. All installed rotating equipment with excessive noise and/or vibration, which cannot be corrected in place, shall be replaced at no cost to Government.

3.15 GENERAL PROCEDURES – VIBRATION ISOLATION

- A. Select isolators in accordance with the manufacturer's recommendations and the equipment weight distribution to allow for proper static deflection of the isolators in relation to the span of the building structure supporting the equipment, considering the allowable deflection and weight of the structure.
- B. Install isolators so they can be easily removed for replacement.

- C. Mount all equipment absolutely level.
- D. Install all isolators per manufacturer's instructions.
- E. Install vibration isolators for mechanical motor driven equipment.
- F. Set steel bases for 1" clearance between housekeeping pad and base.
- G. All vibration isolated equipment shall be fitted with earthquake bracing and snubbers suitable for seismic control in accordance with the IBC.
- H. Piping vibration isolation flexible connections shall be installed at a 90° angle to equipment deflection direction unless otherwise noted.

3.16 SEISMIC RESTRAINT

A. General:

1. All equipment, piping and ductwork shall be restrained to resist seismic/wind forces per the applicable building code(s) as a minimum. Restraint attachments shall be made by bolts, welds or a positive fastening method. Friction shall not be considered. All attachments shall be proven capable of accepting the required wind load by calculations. Additional requirements specified herein are included specifically for this project.
2. Install seismic and wind restraint devices per the manufacturer's submittals. Any deviation from the manufacturer's instructions shall be reviewed and approved by the manufacturer.
3. Attachment to structure for suspended equipment, pipe and duct: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
4. Wall penetrations may be used as bracing locations provided the wall can provide adequate resistance without significant damage.
5. Coordinate sizes and locations of cast-in-place inserts for post-tensioned slabs with seismic restraint manufacturer.
6. Provide hanger rod stiffeners where indicated or as required to prevent buckling of rods due to seismic forces.
7. Where rigid restraints are used on equipment, ductwork or piping, support rods for the equipment, ductwork or piping at restraint locations must be supported by anchors rated for seismic use. Post-installed concrete anchors must be in accordance with ACI 355.2.
8. Ensure housekeeping pads have adequate space to mount equipment and seismic restraint devices and shall also be large enough to ensure adequate edge distance for restraint anchor bolts to avoid housekeeping pad breakout failure.

B. Concrete Anchor Bolts:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid pre- or post-tensioned tendons, electrical and telecommunications conduit, and gas lines.

2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.

C. Equipment Restraints:

1. Seismically restrain equipment all equipment. Install fasteners, straps and brackets as required to secure the equipment.
2. Install seismic snubbers on HVAC equipment supported by floor-mounted, non-seismic vibration isolators. Locate snubbers as close as possible to vibration isolators and attach to equipment base and supporting structure as required.
3. Install neoprene grommet washers on equipment anchor bolts where clearance between anchor and equipment support hole exceeds 1/8" (3.2 mm).
4. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

D. Piping Systems:

E. For projects with a Seismic Design Category of C, provide seismic cable restraints on the following:

1. All piping systems assigned a component importance factor, I_p , of 1.5 with a nominal pipe diameter greater than 2" (50 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).

F. For projects with a Seismic Design Category of D, E or F, provide seismic cable restraints on the following:

1. All piping greater than 3" (75 mm) nominal diameter.
2. All piping systems assigned a component importance factor, I_p , of 1.5 with a nominal pipe diameter greater than 1" (25 mm) or trapeze-supported piping with combined operating weight over 10 lbs/ft (15 kg/m).

G. "12-inch rule", where pipe can be exempted from seismic restraint based on the length of the support rods, is accepted if one of the following conditions are met:

1. Hangers are detailed to avoid bending of the hangers and their attachment; and provisions are made for piping to accommodate expected deflections. The maximum stress due to combined loading including bending in the hangers must be less than 21.6 ksi.
2. Isolation hangers are added to hanger rod to provide swivel joint and to prevent bending moment in hanger.

H. Restraint spacing:

1. For ductile piping, space lateral supports a maximum of 40' (12 m) o.c., and longitudinal supports a maximum of 80' (24 m) o.c.
2. For non-ductile piping (e.g., cast iron, PVC) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
3. For piping with hazardous material inside (e.g., natural gas, medical gas) space lateral supports a maximum of 20' (6 m) o.c., and longitudinal supports a maximum of 40' (12 m) o.c.
4. For pipe risers, restrain the piping at floor penetrations using the same spacing requirements as above.

I. Brace a change of direction longer than 12' (3.7 m).

J. Longitudinal restraints for single pipe supports shall be attached directly to the pipe, not to the pipe hanger.

K. For supports with multiple pipes (trapezes), secure pipes to trapeze member with clamps approved for application.

L. Piping on roller supports shall include a second roller support located on top of the pipe at each restraint location to provide vertical restraint.

M. Install restraint cables so they do not bend across edges of adjacent equipment or building structure.

N. Install flexible metal hose loops in piping which crosses building seismic joints, sized for the anticipated amount of movement.

O. Install flexible piping connectors where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment.

P. Coordinate seismic restraints with thermal expansion compensators, guides and anchor points. Thermal expansion anchor points shall be designed to accommodate seismic forces.

3.17 INSTALLATION OF EQUIPMENT

A. Unless otherwise indicated, mount all equipment and install in accordance with manufacturer's recommendations and approved submittals.

B. Maintain manufacture recommended minimum clearances for access and maintenance.

C. Where equipment is to be anchored to structure, furnish and locate necessary anchoring and vibration isolation devices.

D. Furnish all structural steel, such as angles, channels, beams, etc. required to support all piping, ductwork, equipment and accessories installed under this Division. Use structural supports

suitable for equipment specified or as indicated. In all cases, support design will be based upon data contained in manufacturer's catalog.

- E. Openings: Arrange for necessary openings in buildings to allow for admittance and reasonable maintenance or replacement of all equipment furnished under this Contract.
- F. Access Doors: Provide as necessary for reasonable maintenance of all equipment valves, controls, etc.

END OF SECTION 23 05 00

SECTION 23 05 93
TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Hydronic Systems:
 - 1. Constant Flow Systems.
- B. Air Systems:
 - 1. Constant Volume Air Systems.

1.2 SCOPE

- A. Furnish the professional services of a qualified and approved balancing and testing firm to perform the work of this specification section.
- B. The work of this section includes but is not necessarily limited to:
 - 1. Testing and balancing existing hydronic heating and ventilation systems as indicated on drawings.
 - 2. Testing and balancing fans and air handling systems.
 - 3. Testing and balancing new liquid heat transfer systems.
 - 4. Working directly with the control subcontractor to obtain proper system adjustments.
 - 5. Domestic water distribution system adjustment.
- C. The work of this section does not include:
 - 1. Adjusting burners for proper combustion operation.
 - 2. Liquid waste transfer system adjustment.
 - 3. Fire protection systems.

1.3 APPLICABLE CODES AND STANDARDS

- A. SMACNA Manual for the Balancing and Adjustment of Air Distribution Systems.
- B. AMCA Publication 203, Field Performance Measurements.
- C. American Air Balancing Council (AABC) Recommended Procedures.
- D. National Environmental Balancing Bureau (NEBB) Recommended Procedures.

1.4 QUALIFICATION OF THE BALANCING FIRM OR COMPANY

- A. Subcontractor minimum qualifications include:
 - 1. Demonstrate satisfactory completion of five projects of similar scope in the State of Alaska during the past five years. Provide references if requested.
 - 2. NEBB Certified in Testing, Adjusting and Balancing of Air and Hydronic Systems.

1.5 TIMING OF WORK

- A. Do not begin balancing and testing until the systems, including controls, are completed and in full working order.
- B. Schedule the testing and balancing work in cooperation with other trades.
- C. Complete the testing and balancing at least one week before the date of substantial completion and before any occupancy occurs.

1.6 CONTRACTOR RESPONSIBILITY TO BALANCING AGENCY

- A. Award the test and balance contract to an approved firm or company upon receipt of contract to allow the Balance and Testing Agency to schedule this work in cooperation with other trades involved and comply with completion date.
- B. Put all heating, ventilating and air conditioning systems, equipment and controls into full operation for the Balancing Agency and continue the operation of same during each working day of testing balancing.
- C. Provide scaffolding, ladders and access to each system for proper testing balancing.
- D. Ensure that the building enclosure is complete, including but not limited to, structural components, windows and doors installed, door hardware complete, ceilings complete, stair, elevator and mechanical shafts complete, roof systems complete, etc.
- E. Make any changes in pulleys, belts and dampers, or add any dampers as required for correct balance as recommended by the Balance and Testing Agency at no additional cost to the Government.
- F. Complete installation, programming (including design parameters and graphics), calibration, and startup of all building control systems.
- G. Require that the building control system firm provide access to hardware and software, or onsite technical support required to assist the TAB effort. The hardware and software or the onsite technical support shall be provided at no cost to the TAB firm.

1.7 REPORT

- A. Certified Reports shall be included in project O & M manuals. Reports shall include: testing, adjusting, and balancing reports bearing the signature of the Test and Balance Agency Representative. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the systems are operating at the completion of the testing, adjusting and balancing procedures; and are an accurate record of all final quantities measured, to establish normal operating values of the system. Follow the procedures and format specified below:
1. Draft Reports: Upon completion of testing, adjusting and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports.
 2. Final Reports: Upon verification and approval of the draft report; prepare final reports, typewritten, organized and formatted as specified below.
 3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, 3-ring binders. Provide binding edge labels with the project identification and a title descriptive of the documents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:
 - a. General Information and Summary.
 - b. Air Systems.
 - c. Hydronic Systems.
 - d. Temperature Control Systems.
 - e. Special Systems.
 - f. System Deficiency Reports and Corrective Actions.
 4. Report Contents: Provide the following minimum information, forms and data:
 - a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency; contractor; Government, architect, engineer and project. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the name, address, telephone number and signature of the Certified Test and Balance Personnel. Include in this division a listing of the instrumentation used for the procedures along with the proof of calibration.
 - b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.
 - c. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

1.8 SUBMITTALS

- A. Submit in accordance with Division 01.
- B. Submit balancing agency qualifications and sample balancing forms. C. Provide list of equipment to be used and date of last calibration.
- C. Submit preliminary balance report a minimum of one week prior to balancing system.

PART 2 - PRODUCTS

2.1 INSTRUMENTS

- A. Maintain all instruments accurately calibrated and in good working order. Use instruments with the following minimum performance characteristics.
 - 1. Air Velocity Instruments: Direct reading in feet per minute, 2% accuracy.
 - 2. Static Pressure Instruments: Direct reading in inches water gauge, 2% accuracy.
 - 3. RPM Instruments: Direct reading in revolutions per minute, .5% accuracy; or revolution counter accurate within 2 counts per 1,000.
 - 4. Pressure Readout: Direct reading in feet of water or PSI, .5% accuracy.
 - 5. Temperature Instruments - Direct reading in degrees F, +.5% accuracy.
 - 6. Water Flow Instruments: Differential pressure type; direct reading in feet of water or PSI, accuracy, suitable for readout balancing valve provided.
 - 7. Sound Measuring Instrument: Octave Band Analyzer which essentially complies to AASA Standards SL6 1960 with a range of 24DB to 150 DB sound pressure level ref. .0002 microbar. Calibrate sound test instrument before use to a closed coupler and a driving loudspeaker that produces a know-sound pressure level at the microphone of the analyzer.

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES FOR ALL SYSTEMS

- A. Start with new, clean filters.
- B. In cooperation with the control manufacturer's representative, coordinate adjustments of automatically operated dampers and valves to operate as specified, indicated and/or noted.
- C. Use manufacturer's ratings on all equipment to make required calculations.
- D. Make final adjustments for each space per heating or cooling comfort requirement. State reason for variance from design CFM, i.e., "too noisy", "drafty", etc.
- E. Mark equipment and balancing device settings (including damper-control positions, valve position indicators, fan-speed-controls, and similar controls and devices) with paint or other suitable permanent identification material to show final settings.

3.2 REQUIREMENTS FOR ALL AIR HANDLING SYSTEMS

- A. Identify each diffuser, grille and register as to location and area.
- B. Identify and list size, type and manufacturer of diffusers, grilles, registers and all testing equipment.
- C. In readings and tests of diffusers, grilles and registers, include required FPM velocity and required CFM and test CFM after adjustments. If test apparatus is designed to read CFM directly, velocity reading may be omitted. Identify test apparatus used. Identify wide open (W.O.) runs.
- D. Check and record the following items:
 - 1. Air temperatures; mixed air, after coils, outside air, return air and supply air.
 - 2. Pressure drop at each coil, filter bank, etc.
 - 3. Operating suction and discharge pressure.
 - 4. Full nameplate data of all equipment.
 - 5. Rated and actual running amperage and voltage of all motors.
 - 6. Drive data including sheaves and belts and adjustments.
 - 7. Electrical overloads/heaters sizes and ranges of motors.

3.3 BALANCING LOW VELOCITY CONSTANT VOLUME DUCTWORK

- A. Analyze system and identify major branches. Tabulate design CFM for each branch.
- B. Select the branch which appears to be the longest run from the fan or to have the highest static pressure requirements.
- C. Adjust other branch dampers or the fan to establish 110% design air flow through the selected branch.
- D. Adjust the air flow through each air inlet (exhaust systems) or outlet (supply systems) on the selected branch to within +5% of the requirements so that at least one branch damper serving an inlet (or outlet) is wide open.
- E. Proceed to another branch and set up 110% design airflow. Balance each inlet or outlet to within +5% of requirements, again leaving at least one wide open run. Repeat this process until all branches are balanced 110% airflow.
- F. Once each branch has been balanced at 110% flow with one wide open run on each branch, balance with branches together, leaving at least one branch damper wide open. At this point, adjust the fan delivery so that each branch is at about 110% design airflow. Adjust the branch dampers so that each inlet (or outlet) in the system is within 10% of the required airflow.
- G. Adjust the fan for design airflow.
- H. Read and record the airflow at each inlet and outlet.

- I. Secure each branch damper and mark the balanced position of the damper quadrant
- J. Test and record entering and leaving air temperatures of coils.
- K. Test and record entering and leaving water temperatures of coils.
- L. Test and record static pressure drop across each filter and coil bank.

3.5 FLUID SYSTEM TESTING AND BALANCING

A. Preparation of system - Phase I:

1. Complete air balance before beginning fluid balance.
2. Clean all strainers.
3. Examine fluid in system to determine if treated and clean.
4. Check pump rotation.
5. Verify expansion tanks are not air bound and system full of fluid.
6. Verify all air vents at high points of fluid systems are installed properly and are operating freely. Make certain all air is removed from circuiting system.
7. Open all valves to full flow position including coil and heater stop valves, close bypass valves and open return line balancing cocks. Set temperature controls so that automatic valves are open to full flow through apparatus.
8. Check and set operating temperature of boilers and heat exchangers to design requirements when balancing by temperature drop.
9. Adjust all flows to 110% of design flows as shown.

B. Test and Balance Procedure - Phase II:

1. Set pumps to proper GPM delivery and set proper GPM delivery in main piping runs from boiler room. Note flow variations for additive alternates.
2. Adjust flow of fluid through primary equipment.
3. Check leaving fluid temperatures and return fluid temperatures and pressure drop through major equipment. Reset to correct design temperatures.
4. Check fluid temperature at inlet side of coils and other heat transfer equipment. Note rise or drop of temperatures from source.
5. Balance each coil and all other heat transfer apparatus in system.
6. Upon completion of flow readings and adjustments, mark all settings and record all data.

C. Test and Balance Procedure - Phase III:

1. After making adjustments to coils and apparatus, recheck settings at pumps and major equipment. Readjust if required.
2. Attach pressure gauges on each coil, then read pressure drop through coil at set flow rate on call for full flow through coil. Set pressure drop across bypass valve to match coil full flow pressure drop. This prevents unbalanced flow conditions when coils are on full bypass.
3. Check and record the following items with flows set at 100% of design.
 - a. Inlet and leaving fluid and air temperatures at coils and major equipment.

- b. GPM flow of each coil and major equipment.
 - c. Pressure drop of each coil and major equipment.
 - d. Pressure drop across bypass valve.
 - e. Pump operating suction and discharge pressures and final total developed head.
 - f. Pump GPM.
 - g. Rated and actual running amperage and voltage of pump motor.
 - h. Full nameplate data of all pumps and equipment.
 - i. Electrical overloads/heaters sizes and ranges of motors.
4. Permanently mark adjusted position of all balancing valves. Stamp indicator plate of circuit setters and other balancing valves without memory stop.

END OF SECTION 23 05 93

SECTION 23 07 00
HVAC INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Piping insulation.
- B. Ductwork insulation.
- C. Jackets and accessories.

1.2 RELATED WORK

- A. Division 09 - Painting: Painting insulation jacket.
- B. Section 23 05 00 - Common Work Results for HVAC.

1.3 REFERENCES

- A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- B. ASTM C449 - Mineral Fiber Hydraulic-setting Thermal Insulating and Finishing Cement.
- C. ASTM C533 - Calcium Silicate Block and Pipe Thermal Insulation.
- D. ANSI/ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- E. ANSI/ASTM C552 - Cellular Glass Block and Pipe Thermal Insulation.
- F. ANSI/ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- G. ANSI/ASTM C578 - Preformed, Block Type Cellular Polystyrene Thermal Insulation.
- H. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- I. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- J. ANSI/ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.

- K. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- L. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
- M. ASTM B209 - Aluminum and Aluminum-alloy Sheet and Plate.
- N. ASTM E84 - Surface Burning Characteristics of Building Materials.
- O. ASTM C610 - Expanded Perlite Block and Pipe Thermal Insulation.
- P. NFPA 255 - Surface Burning Characteristics of Building Materials.
- Q. UL 723 - Surface Burning Characteristics of Building Materials.

1.4 QUALITY ASSURANCE

- A. Applicator: Company specializing in piping insulation application with three years minimum experience.
- B. Pipe insulation manufactured in accordance with ASTM C585 for inner and outer diameters.
- C. Materials: Flame spread/smoke developed rating of 25/50 in accordance with UL 723.
- D. Factory fabricated fitting covers manufactured in accordance with ASTM C450.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include product description, thickness for each service, and locations.
- C. Submit manufacturer's installation instructions.

1.6 DELIVERY STORAGE AND HANDLING

- A. Division 01 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Certain-Teed.
- B. Johns Manville.
- C. Knauf.
- D. Owens-Corning.
- E. TrueBro, IPS Corporation.
- F. Substitutions: Under provisions of Division 01.

2.2 INSULATION - PIPING

- A. Type A: Glass fiber, rigid, molded, non-combustible insulation; ANSI/ASTM C547; 'k' value of 0.24 at 75° F, rated to 850° F, vapor retarder jacket of Kraft paper bonded to aluminum foil; Johns Manville "Micro-Lok" or equal.

2.3 FIELD APPLIED JACKET

- A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. PVC Jackets: One piece, pre-molded type, Johns Manville Zeston 2000, fitting covers and jacketing material.
- C. Aluminum Jackets: ASTM B209; .016 inch thick; corrugated or textured finish, longitudinal slip joints.
- D. Stainless Steel Jackets: Type 304 stainless steel; 0.010 inch thick; corrugated finish.

2.4 INSULATION - DUCTWORK

- A. Type B: Exterior FSK Duct Wrap: Flexible glass fiber; ANSI/ASTM C553; commercial grade; 'k' value of 0.27 at 75° F; rigid fiber board; ANSI/ASTM C612, 'k' value of 0.24 at 75° F, 3.0 lb./cu. ft. density. 0.00035 inch foil scrim facing. Minimum thermal performance shall be R=4.8. Johns Manville "Microlite Duct Wrap" and Certainteed "IB board" or equal.

- B. Type C: Duct Liner: CLOSE CELL, CFC- AND HCFC-FREE FLEXIBLE ELASTOMERIC ACOUSTICAL INSULATION WITH SCRIM-REINFORCED ACRYLIC ADHESIVE ON ONE SIDE. ; ASTM C534 TYPE 2 (SHEET) GRADE 1, ASTM E84: 25/50 AT 2" AND BELOW; 'K' VALUE OF 0.25 AT 75 DEG F; R-4.2 AND NOISE REDUCTION COEFFICIENT (NRC) OF 0.5 AT 1" THICK; RECOMMENDED FOR -40 TO 200 DEG F TEMPERATURE APPLICATIONS; INSTALL METAL NOSING FOR AIR VELOCITIES GREATER THAN 4,000 FT./MIN., UL LISTED ADHESIVE GALVANIZED STEEL PINS. K-FLEX USA "K-FLEX DUCT LINER GRAY" OR EQUAL.

2.5 INSULATION ACCESSORIES

- A. Adhesives: Waterproof and fire-retardant type.
- B. Indoor Jacket: 6 oz./sq. yd. canvas or presized glass cloth, minimum 7.8 oz./sq. yd.
- C. Outdoor Jacket: Coated glass fiber sheet, 30 lb/sq. yd.
- D. Lagging Adhesive: Fire resistive to NFPA 255.
- E. Impale Anchors: Galvanized steel, 12 gauge, self-adhesive pad.
- F. Joint Tape: Glass fiber cloth, open mesh.
- G. Tie Wire: Annealed steel, 16 gauge.
- H. Sealants: Compatible with insulation materials, jackets and substates. For indoor applications use sealants that have a VOC content of 250 g/l or less.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Install materials after piping has been tested and approved.
- B. Clean surfaces for adhesives.
- C. Prepare surfaces in accordance with manufacturer's recommendations.

3.2 INSTALLATION - PIPING

- A. Install materials in accordance with manufacturer's recommendations, building codes and industry standards.
- B. Continue insulation vapor barrier through penetrations except where prohibited by code.
- C. Locate insulation and cover seams in least visible locations.

- D. Neatly finish insulation at supports, protrusions, and interruptions.
- E. For insulated pipes conveying fluids above ambient temperature, secure jackets with self sealing lap or outward clinched, expanded staples. Bevel and seal ends of insulation at equipment, flanges, and unions. Insulate complete system, including under fitting jackets.
- F. Provide insert between support shield and piping on piping 1-½" inches diameter or larger. Prefabricated wood blocks, or other heavy density insulating material. Insulation inserts shall not be less than 10" long.
- G. For pipe exposed in mechanical equipment rooms or in finished spaces below 10 feet above finished floor, finish with PVC jacket and fitting covers or metal jacket.
- H. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.
- I. For exterior applications, provide weather protection jacket or coating. Insulated pipe, fittings, joints, and valves shall be covered with PVC or metal jacket. Jacket seams shall be located on bottom side of horizontal piping.
- J. Fully insulate all piping including all spaces under jacketing.

3.3 SCHEDULE - PIPING

PIPING	TYPE	PIPE SIZE Inch	MINIMUM INSULATION THICKNESS Inch
Heating Water Supply and Return	A	All Sizes	1"

3.4 INSULATION - DUCTWORK

- A. Install materials in accordance with manufacturer's instructions.
- B. Provide insulation with vapor barrier when air conveyed may be below ambient temperature. Continue insulation with vapor barrier through penetration.
- C. Exterior Insulation (Type B) Application:
 - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
 - 2. Secure insulation without vapor barrier with staples, tape, or wires.
 - 3. Install without sag on underside of ductwork. Use adhesive or welded mechanical fasteners to prevent sagging. Secure insulation with mechanical fasteners on 15 inch centers maximum, on bottom and side of ductwork with dimension exceeding 20 inches. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive. Stop

and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

4. Maximum 25% compression.

D. Liner (Type C) Application:

1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15 inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Butt joints together tightly then seal and smooth. Thoroughly coat ends of liner with adhesive. Do not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.
3. Install liner on all fan discharge and intake ductwork for a distance of twenty feet or five feet past the first 90° elbow, whichever is greater.

3.5 SCHEDULE - DUCTWORK

DUCTWORK	TYPE	INSULATION THICKNESS Inch	FINISH
Exhaust & Relief Ducts Within 10 ft. of Exterior Openings	B	1" Rigid	Flexible FSK C10", rigid insulation with canvas >10" use in mechanical rooms
Outside Air Intake Ducts	B	2" Rigid	CANVAS
Internal Acoustic Lining	C	1"	

END OF SECTION 23 07 00

SECTION 23 09 00
HVAC INSTRUMENTATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Pressure gauges and pressure gauge taps.
- B. Thermometers and thermometer wells.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 23 21 13 - Hydronic Piping: Installation of thermometer wells, pressure gauge tappings.

1.3 RELATED SECTIONS

- A. Section 23 09 00 – Direct Digital Controls for HVAC.
- B. Section 23 09 93 - Sequence of Operation.

1.4 REFERENCES

- A. ASTM E1 - Specification for ASTM Thermometers.
- B. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.
- C. AWWA C700 - Cold Water Meters - Displacement Type.
- D. AWWA C706 - Direct Reading Remote Registration Systems for Cold Water Meters.

1.5 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Product Data: Include list which indicates use, operating range, total range and location for manufactured components.
- C. Submit manufacturer's installation instructions under provisions of Division 01.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Division 01.
- B. Accurately record actual locations of instrumentation.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install instrumentation when areas are under construction, except for required rough-in, taps, supports and test plugs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Dwyer.
- B. Terice.
- C. Marshalltown.
- D. Ashcroft.
- E. Enerpac.
- F. Sisco.
- G. Petersen.
- H. Substitutions: In accordance with Division 01.

2.2 PRESSURE GAUGES

- A. 4-1/2 inch diameter cast aluminum case, phosphor bronze bourbon tube, rotary bronze movement, brass socket, black figures on white background, one percent mid-scale accuracy, scale calibrated in psi. Model 600C as manufactured by Terice.

2.3 PRESSURE GAUGE TAPS

- A. Gauge Isolation Valve: Lever handle ball valve, forged brass body, chrome plated brass ball, viton o-rings for maximum 150 psig. Model Mini T-82-M as manufactured by Jomar.
- B. Needle Valve: Brass for maximum 150 psig. Model 735 as manufactured by Terice.

- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections. Series 870 as manufactured by Trerice.
- D. Coil Siphon: Brass, 1/4", male pipe thread each end. 885 series.

2.4 STEM TYPE THERMOMETERS

- A. 9 inch scale, universal adjustable angle, red appearing mercury, lens front tube, cast aluminum case with blueblack metallic finish and clear Lexan window, extended brass stem, cast aluminum adjustable joint with positive locking device, 2 percent of scale accuracy to ASTM E77, scale calibrated in both degrees F and degrees C. BX9 series as manufactured by Trerice.

2.5 SOLAR DIGITAL THERMOMETERS

- A. Hi-impact ABS case; -50/300°F switchable range; 1/2" LCD digits, wide ambient formula display; 1% accuracy; 1/10°F between -19.9/199.9°F resolution; 10 Lux (one foot-candle) LUX rating; 10 second update rate; -30/140°F ambient operating range; Glass passivated thermistor – NTC sensor. Model Digital Vari-angle as manufactured by Weiss Products.

2.6 THERMOMETER SUPPORTS

- A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.
- B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.7 TEST PLUGS

- A. Test Plug: 1/4 inch or 1/2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with Nordel or Viton core for temperatures up to 350 degrees F.
- B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gauge, two gauge adapters with 1/8 inch probes, two 1-1/2 inch dial thermometers.

2.8 STATIC PRESSURE GAUGES

- A. 4 inch diameter dial in cast aluminum case, magnehelic differential pressure gauge, black figures on white background, front recalibration adjustment with tubing, static pressure tips, adjustable signal flag. Series 2000 as manufactured by Dwyer.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install positive displacement meters with isolating valves on inlet and outlet. Provide full line size valved bypass with globe valve for liquid service meters.
- C. Provide two pressure gauges per pump, installing taps [before strainers and] on suction and discharge of pump. Pipe to gauge with isolation valve to each tapping.
- D. Install pressure gauges with pulsation dampers. Provide needle valve or gauge isolation valve to isolate each gauge. Provide coil siphon for all pressure gauges installed on steam and condensate systems.
- E. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Select bulb length to reach centerline of pipe.
- F. Install thermometers in air duct systems on flanges.
- G. Install thermometer sockets adjacent to controls system thermostat, transmitter, or sensor sockets.
- H. Locate duct mounted thermometers minimum 10 feet downstream of mixing dampers, coils, or other devices causing air turbulence or provide with averaging bulb.
- I. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- J. Install gauges and thermometers in locations where they are easily read from normal operating level.

3.2 PRESSURE GAUGE SCHEDULE

LOCATION	SCALE RANGE
Pumps less than 40' TDH	0 - 30 PSIG
Pumps more than 40' TDH	0 - 60 PSIG
Heating water system	0 - 30 PSIG
Others	As applicable

3.3 STEM TYPE THERMOMETER SCHEDULE

LOCATION	SCALE RANGE
Heating water system	0 - 200° F
Others	As applicable

END OF SECTION 23 09 00

SECTION 23 09 93

SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Boiler Water.
- B. Heating Water Pumps.
- C. Domestic Hot Water Generator.
- D. Ventilation Fans.
- E. Exhaust Fans.
- F. Baseboard Convectors.
- G. Unit Heaters.
- H. Elevator Sump Pump.
- I. Duct Mounted Heating Coils.
- J. Heat Recovery Ventilator.

1.2 RELATED SECTIONS

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 21 23 - Hydronic Pumps.
- C. Section 23 52 23 – Cast Iron Boilers.
- D. Section 23 72 00 – Air to Air Energy Recovery Equipment.

1.3 SYSTEM DESCRIPTION

- A. This Section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Submit diagrams indicating mechanical system controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.
- C. Include flow diagrams for each control system, graphically depicting control logic.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under provisions of Division 01.
- B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION

3.1 BOILER WATER CONTROL (B-1, CP-1)

- A. Alarms:
 - 1. Flame Failure.
 - 2. Low Water Cut-off.
 - 3. High Limit Cut-off.
 - 4. Low Return Water Temperature.
 - 5. Low system pressure.
- B. Manual Control and Indication:
 - 1. H-O-A Control.
 - 2. On-Off-Firing Rate Indication.
 - 3. Main hydronic loop HWR temperature indication.
 - 4. Main hydronic loop HWS temperature indication.
 - 5. HWS temperature indication.
 - 6. Pump H-O-A Control.
 - 7. Pump On-Off Indication.
 - 8. Outdoor temperature reset adjustment.
 - 9. HWR desired temperature adjustment.
 - 10. Alarm setpoints.
- C. Automated Control:

1. Hydronic Loop Temperature: The boilers shall start, stop, and the burner firing rate shall modulate to maintain the main hydronic loop desired temperature as sensed by the sensor located in the main hydronic loop downstream of both boilers. The main hydronic loop desired temperature shall be reset based on adjustable outside temperature. Initial settings as follows:

Outside Temperature	Loop HWS Temperature
0° F	180° F
60° F	150° F

2. Boiler Operation and Thermal Shock Protection: The boiler loop mixing valve will modulate to maintain the HWR desired temperature as sensed by the sensor located on the HWR piping at the boiler.
 - a. On call for the lead boiler, the boiler circulating pump shall start, the normally closed mixing valve will divert flow through the boiler loop, and the boiler shall fire at low fire until the return water temperature reaches the return water setpoint temperature (adjustable, initially set at 140 F). At that point the boiler shall be modulated to meet the loop water temperature demand. The mixing valve will modulate to maintain the desired return water temperature.

3.2 HYDRONIC PUMP (CP-2)

A. Alarms:

1. No flow.

B. Manual Control and Indication:

1. H-O-A Control.
2. On-Off Indication.
3. Outside temperature setpoint adjustment.

C. Automated Control:

1. The lead pump shall operate when the outside temperature is below 60° F (adjustable). The pump shall be off when the outside temperature is above 60° F.

3.3 DOMESTIC HOT WATER GENERATOR

A. Alarms:

1. None.

B. Manual Control and Indication:

1. On-Off Control.
2. Domestic HW supply temperature setpoint.

C. Automated Control:

1. The boiler circulator CP-1 will supply heating water to the hot water generator as needed.

3.4 BOILER ROOM VENTILATION FAN (VF-1)

A. Alarms:

1. None.

B. Manual Control and Indication:

1. H-O-A control.
2. On-off indication.
3. S/A temperature setpoint.

C. Automated Control:

1. Unit shall operate continuously.
2. The space thermostat will modulate the glycol heating coil control valve to maintain setpoint.
3. On freeze alarm (initially 40° F), the fan shall stop, O/A dampers will fully close, R/A dampers will fully open, heating valve control valve will go to full open. Provide automatic reset.

3.5 TOILET EXHAUST FANS (EF-1 THRU EF-4)

A. Alarms - none.

B. Manual Control and Indication:

1. On-off indication.

C. Automated Control:

1. Fan will be interlocked to operate with the local lighting circuit.

3.6 BASEBOARD CONVECTORS (FT-1, FT-2)

A. Alarms:

1. None

B. Manual Control and Indication:

1. Space temperature day mode setpoint.
2. Space temperature night mode setpoint.
3. Space temperature indication.

4. Operation mode schedule adjustment.
5. Operation mode indication.

C. Automated Control:

1. Operation Mode: Day and night mode of operation will be controlled by a seven (7) day time clock.
2. Night Mode: Terminal control valve will cycle to maintain night mode setpoint.
3. Day Mode: Terminal control valve will cycle to maintain day mode setpoint.

3.7 UNIT HEATERS (UH-1)

A. Alarms:

1. None.

B. Manual Control and Indication:

1. Space temperature setpoint.
2. Space temperature indication.

C. Automated Control:

1. Fan will cycle to maintain setpoint.

3.8 ELEVATOR SUMP PUMP (SP-1)

A. Alarms:

1. High level.

B. Manual Control and Indication:

1. H-O-A Control.
2. On-off indication.

C. Automated Control:

1. Pump will operate to maintain water level as determined by float sensor.
2. High level alarm will initiate at water level above second high level float sensor.

3.10 DUCT MOUNTED HEATING COILS (HC-1)

A. Alarms:

1. None.

B. Control and Monitoring:

1. None.

C. Automated Control:

1. The preheat coils (PHC-1,2) shall modulate their heating valves to maintain an outlet air temperature of 35 deg. F.
2. The heat coils (HC-1,2) shall modulate their heating valves to maintain an outlet air temperature of 70 deg. F.

3.11 HEAT RECOVERY VENTILATORS (HRV-1)

A. Alarms:

1. None.

B. Control and Monitoring:

1. On-off indication
2. S/A fan speed setpoint (low/med/high).
3. E/A fan speed setpoint (low/med/high).

C. Automated Control:

1. Day and night mode of operation will be controlled by a seven (7) day programmable controller provided by the manufacturer. Controller shall provide option for manual override for 20-40-60 minutes.

END OF SECTION 23 09 93

SECTION 23 11 10
FACILITY FUEL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Fuel Oil Piping - Above Ground.
- B. Fuel Oil Piping - Buried.
- C. Unions.
- D. Valves.
- E. Pipe Hangers and Supports.
- F. Relief Valves.
- G. Strainers.
- H. Flexible Connectors.
- I. Underground Pipe Markers.
- J. Fuel Oil Dearator / Filter.

1.2 RELATED WORK

- A. Division 02 - Excavating, Backfilling, Trenching.
- B. Section 23 05 00 - Common Work Results for HVAC.
- C. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B16.3 - Malleable Iron Threaded Fittings.
 - 2. ASME B31.1 - Power Piping.
 - 3. ASME B31.9 - Building Services Piping.
 - 4. ASME B36.10M - Welded and Seamless Wrought Steel Pipe.
 - 5. ASME Section IX - Boiler and Pressure Vessel Code - Welding and Brazing Qualifications.

B. ASTM International:

1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
2. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.

C. American Welding Society:

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.
2. AWS D1.1 - Structural Welding Code - Steel.

D. National Fire Protection Association:

1. NFPA 30 - Flammable and Combustible Liquids Code.
2. NFPA 31 - Standard for the Installation of Oil-Burning Equipment.

E. Underwriters Laboratories Inc.:

1. UL 567 - Pipe Connectors for Flammable Liquids and Combustible Liquids and LP-Gas.
2. UL 842 - Valves for Flammable Fluids.
3. UL 913 - Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1, Hazardous Locations.

1.4 SUBMITTALS

A. Submittal Procedures under provisions of the Division 01.

B. Product Data:

1. Piping: Submit data on pipe materials, fittings, and accessories. Submit manufacturers catalog information.
2. Valves: Submit manufacturer's catalog information with valve data and ratings for each service.
3. Fuel Piping Specialties: Submit manufacturer's catalog information including capacity, rough-in requirements, and service sizes.

C. Test Reports: Submit written test results for piping system pressure test.

D. Manufacturer's Installation Instructions: Submit piping system and piping accessories.

1.5 CLOSEOUT SUBMITTALS

A. Project Record Documents: Record actual locations of valves, piping system, and system components.

B. Project Record Documents: Record actual locations of piping mains with invert elevations and valves.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with NFPA 31.
- B. Perform Work in accordance with authority having jurisdiction.

1.7 QUALIFICATIONS

- A. Installer: Company specializing in performing work of this section with minimum three years documented experience or approved by manufacturer.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle under the provisions of the Division 01.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Protect piping and fittings from soil and debris with temporary end caps and closures. Maintain in place until installation.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Under the provisions of the Division 01.
- B. Do not install underground piping when bedding is wet or frozen.

1.10 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.11 COORDINATION

- A. Under the provisions of the Division 01.
- B. Coordinate trenching, excavating, bedding, backfilling of buried piping systems with requirements of Division 31.

1.12 WARRANTY

- A. Under the provisions of the Division 01.

PART 2 - PRODUCTS

2.1 FUEL OIL PIPING - ABOVE GROUND

- A. Steel Pipe: ASTM A53/A53M or ASME B36.10M Schedule 40 black.
 - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M wrought carbon steel and alloy steel welding type.
 - 2. Joints: Welded, Threaded, or Viega MegaPress (or approved equal).

2.2 FUEL OIL PIPING – BURRIED (FLEXIBLE FUEL OIL PIPING SYSTEM)

- A. Manufacturers:
 - 1. OPW FlexWorks.
 - 2. Substitutions: Under the provisions of Division 01.

2.3 FLEXIBLE FUEL OIL PIPING SYSTEM

- A. Double-Wall Flexible Primary Piping: UL971 listed:
 - 1. KYNAR™ PVDF outer jacket.
 - 2. Braided fiber reinforcement.
 - 3. Hydrologically stabilized fuel-grade polyurethane layer.
 - 4. KYNAR PVDF core layer (Polyvinylidene Fluoride).
- B. Primary and secondary pipe is tested for Type A & Type B external and internal fluids inside and out. Working Pressure: 75PSIG, 5 BAR Average, Burst Pressure: 600PSIG, 40 BAR, Temperature Rating: -20° to +120°F, -29° to +49°C, Minimum Bend Radius: 24 in., 600 mm.
- C. Double Wall Flexible Access Piping: Crush and puncture-resistant flexible corrugated outer wall with smooth inner surface, rated for H-20 loading.
- D. Primary Pipe Fittings: Primary pipe fitting and couplings shall be of stainless steel construction specially designed for flexibility in installation of pipe. Brass couplings shall not be permitted.
- E. Transition Piping Sumps: Constructed of one-piece polyethylene complete with water-resistant cover with cover gasket, handle and cover hold downs.
- F. Tank Sumps: Two piece, filament wound with homogeneous vinyl ester resin construction with mechanically fastened water tight removable cover.
- G. Pipe and conduit entry seals: Pipe and conduit entry seals shall have an exterior studded compression ring encapsulated within rubber to protect it from corrosion. All studs shall be stainless steel and exposed only on the inside of the containment chamber.

2.4 UNIONS

- A. Ferrous Piping: Class 150, malleable iron, threaded.
- B. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.5 GATE VALVES

- A. No allowed.

2.6 GLOBE VALVES

- A. Not Allowed.

2.7 BALL VALVES

- A. MSS SP 110, Class 125, two piece, threaded ends, bronze body; chrome plated bronze ball, reinforced Teflon seats, blow-out proof stem, lever handle, UL 842 listed for flammable liquids and LPG, full port.

2.8 CHECK VALVES

- A. Swing Check Valves
 - 1. MSS SP 80, Class 150, bronze body and cap, bronze seat, Buna-N disc, threaded ends.
- B. Spring Loaded Check Valves:
 - 1. MSS SP 80, Class 150 bronze body, in-line spring lift check, silent closing, Buna-N disc, integral seat, threaded ends.

2.9 HANGERS AND SUPPORTS

- A. Conform to NFPA 31.
- B. Malleable iron or Carbon steel, adjustable swivel, split ring.

2.10 RELIEF VALVES

- A. ASME certified and labeled. Maximum working temperature: 450 degrees F. Body: Bronze. Seat: Viton or Monel. Stem and Springs: Stainless steel. Threaded ends. Automatic type, direct pressure actuated at maximum 60psi.

2.11 STRAINERS

- A. Manufacturers:
 - 1. Mueller Steam Specialty.
 - 2. O.C. Keckley Company.
 - 3. Spirax Sarco, Inc.
 - 4. Substitutions: Under the provisions of the Division 01.
- B. Y pattern, bronze body, threaded ends, Class 150, 1/32 inch stainless steel perforated screen.

2.12 FLEXIBLE CONNECTORS

- A. Manufacturers:
 - 1. Flex-Hose Co., Inc.
 - 2. Flex-Weld, Inc.
 - 3. The Metraflex Company.
 - 4. Substitutions: Under the provisions of the Division 01.
- B. Corrugated Type 304 stainless steel inner hose with single layer of Type 304 stainless steel exterior braiding. Maximum working pressure 200 psig.

2.13 ACCEPTABLE MANUFACTURER – DE-AERATOR / FILTER

- A. Tigerholm.
- B. Substitutions: None.

2.14 DE-AERATOR FUEL FILTERS

- A. UL listed fuel oil de-aerator, converts single pipe supply to two-pipe system complete with fusible valve and integral fuel filter, Tigerholm Tigerloop Combi.

2.15 UNDERGROUND PIPE MARKERS

- A. Plastic Ribbon Tape: Bright colored, continuously printed, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service complete with trace wire.

2.16 BEDDING AND COVER MATERIALS

- A. Refer to Division 31.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify 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 - PIPE HANGERS AND SUPPORTS

- A. Install hangers and supports in accordance with ASTM F708 and MSS SP 89.
- B. Support horizontal piping hangers as scheduled.
- C. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Install hangers to allow 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
- F. Where installing several pipes in parallel and at same elevation, provide multiple pipe hangers or trapeze hangers.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

3.4 INSTALLATION - BURIED PIPING SYSTEMS

- A. Piping Trench and Pipe Burial Requirements: Buried fuel oil piping system must be installed in accordance with all prevailing Federal, State, and Local codes and all applicable Manufacturers Installation Instructions.

3.5 INSTALLATION - ABOVEGROUND PIPING

- A. Install fuel oil piping in accordance with NFPA 31.
- B. Route piping in orderly manner and maintain gradient.

- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Sleeve pipe passing through partitions, walls and floors. Refer to Section 23 05 00.
- G. Install fire stopping at fire rated construction perimeters and openings containing penetrating sleeves and piping. Refer to Division 07.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access where valves and fittings are not exposed.
- J. Prepare pipe, fittings, supports, and accessories not pre-finished, ready for finish painting. Refer to Division 09.
- K. Install identification on piping systems including underground piping. Refer to Section 23 05 00.
- L. Install valves with stems upright or horizontal, not inverted.
- M. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the Work, and isolating parts of completed system.

END OF SECTION 23 11 10

SECTION 23 21 13
HYDRONIC PIPING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Pipe and Pipe Fittings.
- B. Valves.
- C. Heating Water Piping System.

1.2 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC.
- B.
- C. Section 23 05 19 – Meters and Gages for HVAC Piping.
- D. Section 23 07 00 - HVAC Insulation.
- E. Section 23 21 16 - Hydronic Piping Specialties.
- F. Section 23 21 23 - Hydronic Pumps.
- G. Section 23 52 23 - Cast Iron Boilers.

1.3 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9.

1.4 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ANSI/ASME SEC 9, and applicable state labor regulations.
- C. Welders Certification: In accordance with ANSI/ASME SEC 9.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Include data on pipe materials, pipe fittings, valves, and accessories.
- C. Include welders certification of compliance with ANSI/ ASME SEC 9.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Deliver and store valves in shipping containers with labeling in place.

PART 2 - PRODUCTS

2.1 HEATING WATER PIPING, ABOVE GROUND

- A. Steel Pipe: ASTM A53, Schedule 40, for sizes 4 inch and over, black.
 - 1. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, steel welding type fittings.
 - 2. Joints: Screwed, or ANSI/AWS D1.1, welded.
- B. Copper Tubing: ASTM B88, Type L, hard drawn.
 - 1. Fittings: ANSI/ASME B16.18 cast bronze or ANSI/ASME B16.29 solder wrought copper.
 - 2. Joints: ASTM B32, solder, Grade 95TA or ANSI/AWS A5.8, BCuP silver braze; Flux: ASTM B813.
 - 3. Press Fittings: Viega ProPress Fittings are allowed. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press end shall have Smart Connect feature design leakage path. Smart Connect™ (SC Feature) In ProPress ½" to 4" dimensions the Smart Connect Feature assures leakage of liquids and/or gases from inside the system past the sealing element of an un-pressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.
- C. Grooved piping systems are not allowed.

2.2 EQUIPMENT DRAINS AND OVERFLOWS

- A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ANSI/ASME B16.18 cast bronze, or ANSI/ASME B16.29 solder wrought copper.
 2. Joints: ASTM B32, solder, Grade 95TA or ANSI/AWS A5.8, BCuP silver braze; Flux: ASTM B813.
- B. PVC Pipe: ASTM D1785, Schedule 40, and Schedule 80 for sizes 8 inch and larger, or ASTM D2241, SDR 21 or 26.
1. Fittings: ASTM D2466 or D2467, PVC.
 2. Joints: ASTM D2855, solvent weld.

2.3 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under: bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 Inches: bronze flanges for copper piping.

2.4 GATE VALVES

- A. Gate valves will not be permitted. Use ball or butterfly valves for isolation.

2.5 GLOBE VALVES

- A. Globe valves will not be permitted. Use ball or butterfly valves for throttling.

2.6 ACCEPTABLE MANUFACTURERS - ALL VALVE TYPES

- A. Milwaukee.
- B. Nibco.
- C. Crane.
- D. Hammond.
- E. Substitutions: Under provisions of Division 01.

2.7 BALL VALVES

- A. Up to 2 Inches: Bronze two piece body, full port, forged brass, chrome plated ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union. Seat material to be compatible with fluid handled.

2.8 PLUG COCKS

- A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, Teflon packing, threaded ends, with one wrench operator for every ten plug cocks.
- B. Over 2 Inches: Cast iron body and plug, pressure lubricated, Teflon packing, flanged ends, with wrench operator with set screw.

2.9 SWING CHECK VALVES

- A. Up to 2 Inches: Bronze 45° swing disc, solder ends.
- B. Over 2 Inches: Iron body, bronze trim, 45° swing disc, renewable disc and seat, flanged ends.

2.10 SPRING LOADED CHECK VALVES

- A. Iron body, bronze trim, stainless steel spring, renewable composition disc, screwed, wafer or flanged ends.

2.11 RELIEF VALVES

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

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.
- D. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

- A. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- B. Install piping to conserve building space, and not interfere with use of space and other work.
- C. Group piping whenever practical at common elevations.

- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- E. Provide clearance for installation of insulation, and access to valves and fittings.
- F. Provide access where valves and fittings are not exposed.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- I. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Division 09.
- J. Install valves with stems upright or horizontal, not inverted.

3.3 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. Sweat solder adapters to pipe.
- C. Install ball or butterfly valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- D. Install ball or butterfly valves for throttling, bypass, or manual flow control services.
- E. Provide spring loaded check valves on discharge of condenser water pumps.
- F. Provide ¾ inch ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. [Pipe to nearest drain.]

3.4 CLEANING OF THE HYDRONIC SYSTEM

- A. Prior to starting work, verify system is complete. Thoroughly flush, drain and refill system.
- B. Fill the heating glycol piping systems system with the system cleaner, Hercules, utilize one (1) quart hydronic system cleaner for every twenty (20) gallons of water in the hydronic system.
- C. Boil out system for a period of four (6) hours at a minimum temperature of 195° F.
- D. Upon completion of boil out, completely flush system and drain all low points. Remove, clean and reinstall strainer baskets.

- E. Fill system with water or glycol as indicated on the plans. Feed water to system through make-up line with pressure regulator, venting system high points. Set to fill at 12 psig. Pressure system cold at 5 psig, adjust when hot to 12 psig. See Specification Section 23 21 16 for glycol fill procedures.
- F. Submit a written and signed statement to the Government that the above referenced cleaning procedures have been completed.

3.5 TESTING

- A. Test all heating water and glycol piping hydrostatically at 100 psig or 150 percent of working pressure, whichever is greater, for a period of 4 hours. Observe piping during this period and repair all leaks.

END OF SECTION 23 21 13

SECTION 23 21 16
HYDRONIC SPECIALTIES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Expansion Tanks.
- B. Air Vents.
- C. Air Separators.
- D. Strainers.
- E. Balance Valves.
- F. Relief Valves.

1.2 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC.
- B.
- C. Section 23 21 23 - Hydronic Pumps.
- D. Section 23 52 23 - Cast Iron Boilers.

1.3 REFERENCES

- A. ANSI/ASME - Boilers and Pressure Vessels Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.

1.5 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.

1.6 SUBMITTALS

- A. Submit product data under provisions of Division 01 and Section 23 05 00.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include installation instruction, assembly views, lubrication instructions, and replacement parts list.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Amtrol.
- B. Taco.
- C. Bell & Gossett.
- D. Substitutions: Under provisions of Division 01.

2.2 DIAPHRAGM-TYPE COMPRESSION TANKS

- A. Construction: Welded steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code; 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 ACCEPTABLE MANUFACTURERS - AIR VENTS

- A. Taco.
- B. Amtrol.
- C. Bell & Gossett.

- D. Substitutions: Under provisions of Division 01.

2.4 AIR VENTS

- A. Manual Type: Disk type vent with built-in check valve for manual or automatic operation, discs replaceable without draining system, 1/8 inch shank, rated at 50 psi; Hoffman No. 500 or equal.
- B. Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; 1/8 inch NPT connection to atmosphere with drain piping suitable for system operating temperature and pressure; with isolating valve. Hoffman No. 79 or equal.
- C. High Capacity Automatic Air Vent: Cast iron body, stainless steel and brass trim, EPDM diaphragm, rated for 250°F, 2 PSIG through 150 PSIG, 3/4 inch system connection, 3/8 inch NPT connection to atmosphere with drain piping. Provide with isolation valve and strainer upstream of vent. Armstrong AAE-750 or equal.

2.5 ACCEPTABLE MANUFACTURERS - AIR SEPARATORS

- A. Bell & Gossett.
- B. Amtrol.
- C. Taco.
- D. Substitutions: Under provisions of Division 01.

2.6 AIR SEPARATORS

- A. Dip Tube Fitting: For 125 psig operating pressure; to prevent free air collected in boiler from rising into system.
- B. In-line Air Separators: Cast iron for sizes 1-½ inch and smaller, or steel for sizes 2 inch and larger; tested and stamped in accordance with Section 8D of ANSI/ASME Code; for 125 psig operating pressure.
- C. Air Elimination Valve: Bronze, float operated, for 125 psig operating pressure.
- D. Combination Air Separators/Strainers: Steel, tested and stamped in accordance with Section 8D of ANSI/ASME Code, for 125 psig operating pressure, with galvanized steel integral strainer with 3/16 inch perforations, tangential inlet and outlet connections, and internal stainless steel air collector tube.

2.7 ACCEPTABLE MANUFACTURERS - STRAINERS

- A. Bell & Gossett.

- B. Taco.
- C. Armstrong.
- D. Substitutions: Under provisions of Division 01.

2.8 STRAINERS

- A. Size 2 inch and Under: Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 2-½ inch to 4 inch: Flanged iron body for 175 psig working pressure, Y pattern with 3/64 inch stainless steel perforated screen.
- C. Size 5 inch and Larger: Flanged iron body for 175 psig working pressure, basket pattern with 1/8 inch stainless steel perforated screen.

2.9 ACCEPTABLE MANUFACTURERS - BALANCE VALVES

- A. Armstrong.
- B. Taco.
- C. Bell & Gossett.
- D. Substitutions: Under provisions of Division 01.

2.10 BALANCE VALVES

- A. Angle or straight pattern, inside screw globe valve for 125 psig working pressure, with bronze body and integral union for screwed connections, renewable composition disc, plastic wheel handle for shut-off service, and lockshield key cap [and set screw memory bonnet] for balancing service.

2.11 ACCEPTABLE MANUFACTURERS - RELIEF VALVES

- A. Watts.
- B. Taco.
- C. Bell & Gossett.
- D. Substitutions: Under provisions of Division 01.

2.12 RELIEF VALVES

- A. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.

PART 3 - EXECUTION

3.1 INSTALLATION AND APPLICATION

- A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
- B. Support tanks inside building from building structure and in accordance with manufacturer's instructions.
- C. Where large air quantities can accumulate, provide enlarged air collection standpipes.
- D. Provide manual air vents at system high points and as indicated.
- 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 blow down connection.
- G. Support pump fittings with floor mounted pipe and flange supports.
- H. Provide shutoff valves on water inlet to terminal heating units such as baseboard and unit heaters.
- I. Provide balancing valves on water outlet from terminal heating units.
- J. 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.
- K. Pipe relief valve outlet to nearest floor drain.
- L. Where one line vents several relief valves, make cross sectional area equal to sum of individual vent areas.

3.2 AIR VENT APPLICATION SCHEDULE

Location	Type
Terminal heating units, mains below	Manual
Terminal heating units, mains above	None
Heating mains, at high points in system	Automatic

Combination air separator/strainers

High capacity

Note: For terminal heating units, mains above unit, install branch piping connections at bottom of mains or 45° from bottom to allow air migration to mains.

END OF SECTION 23 21 16

SECTION 23 21 23
HYDRONIC PUMPS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. In-line Circulators.

1.2 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 21 13 - Hydronic Piping.
- C. Section 23 21 16 - Hydronic Piping Specialties.

1.3 REFERENCES

- A. ANSI/UL 778 - Motor Operated Water Pumps.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacture, assembly, and field performance of pumps with minimum three years' experience.
- B. Alignment: Base mounted pumps shall be aligned by qualified millwright and alignment certified.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Submit certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Grundfos.
- B. Bell & Gossett.
- C. Taco.
- D. Armstrong.
- E. Substitutions: Under provisions of Division 01.

2.2 GENERAL CONSTRUCTION REQUIREMENTS

- A. Balance: Rotating parts, statically and dynamically.
- B. Construction: To permit servicing without breaking piping or motor connections.
- C. Pump Motors: Operate at 1750 rpm unless specified otherwise.
- D. Pump Connections: Flanged.

2.3 IN-LINE CIRCULATORS

- A. Type: Maintenance free, self-lubricated, 3 speed industrial/commercial single stage, direct drive circulator.
- B. Casing: Cast iron.
- C. Impeller: Type 304 stainless steel.
- D. Bearings: Upper and lower radial bearings to be aluminum oxide ceramic, tungsten carbide shaft bearing surfaces.
- E. Shaft: Stainless steel with type 430F.

2.4 VFD CONTROLLED IN-LINE CIRCULATORS

- A. Type: Maintenance free, self-lubricated, pump mounted VFD controlled industrial/commercial single stage, direct drive circulator.
- B. Differential pressure monitoring.
- C. Casing: Cast iron.
- D. Impeller: Type 304 stainless steel.
- E. Bearings: Upper and lower radial bearings to be aluminum oxide ceramic, tungsten carbide shaft bearing surfaces.
- F. Shaft: Stainless steel with type 430F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install pumps in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
- C. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- D. Provide line sized shut-off valve and strainer on pump suction, and line sized combination pump discharge valve on pump discharge.

END OF SECTION 23 21 23

SECTION 23 26 00

TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Baseboard radiation.
- B. Unit heaters.
- C. Hydronic radiant heaters.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

- A. Section 23 09 05 - Instrumentation for HVAC: Installation of room thermostats.
- B. Section 26 05 03 - Equipment Wiring Connections: Installation of room thermostats.

1.3 RELATED SECTIONS

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC.
- C. Section 23 07 00 – HVAC Insulation.
- D. Section 23 09 00 - HVAC Instrumentation.
- E. Section 23 09 93 - Sequence of Operation for HVAC Controls.
- F. Section 23 21 13 – Hydronic Piping.
- G. Section 23 21 16 - Hydronic Specialties.
- H. Section 26 05 03 - Equipment Wiring Connections: Electrical supply to units.

1.4 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
- C. Indicate mechanical and electrical service locations and requirements, specifically indicating deviations from indicated products.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Division 01.
- B. Accurately record actual locations of access doors in radiation cabinets required for access or valving.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years experience.

1.9 REGULATORY REQUIREMENTS

- A. Conform to applicable code for internal wiring of factory wired equipment.

1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect units from physical damage by storing in protected areas and leaving factory covers in place.

1.11 SEQUENCING AND SCHEDULING

- A. Install radiation, convectors, fan-coil units, unit ventilators and radiant heaters (equipment exposed to finished areas) after walls and ceiling are finished and painted. Avoid damage.

1.12 WARRANTY

- A. Provide one year manufacturer's warranty under provisions of Division 01.
- B. Warranty: Include coverage of unit heater and cabinet unit heater motors.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - BASEBOARD RADIATION, FINNED TUBE RADIATION, UNIT HEATERS, CABINET UNIT HEATERS

- A. Sterling.
- B. Rittling .
- C. Modine.
- D. Trane.
- E. Vulcan.
- F. Dunham Bush
- G. Substitutions: Under provisions of Division 01.

2.2 BASEBOARD RADIATION

- A. Heating Elements: ¾ inch ID copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins, one tube end belled, single row.
- B. Enclosure: Minimum 18 gauge steel with 18 inch high back and top of one piece; front panel, end panel, end caps, corners, and joiner pieces to snap together, with front panel easily removable. Provide full length damper.
- C. Finish: Factory applied baked enamel of white color on visible surfaces of enclosure or cabinet.
- D. Element Brackets: 18 gauge galvanized steel to support from panel and noise free element cradle.
- E. Capacity: Based on 65° F entering air temperature, 170° F average water temperature.

2.3 UNIT HEATERS

- A. Coils: Seamless copper tubing, 0.025 inch minimum wall thickness, silver brazed to steel headers, and with evenly spaced aluminum fins mechanically bonded to tubing.
- B. Casing: 18 gauge steel with threaded pipe connections for hanger rods.
- C. Finish: Factory apply baked enamel color as selected on visible surfaces of enclosure or cabinet.
- D. Fan: Direct drive propeller type, statically and dynamically balanced, with fan guard; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.
- E. Air Outlet: Adjustable pattern diffuser on projection models and two way louvers on horizontal throw models.
- F. Motor: Refer to Section 23 05 00; horizontal models with permanently lubricated sleeve bearings; vertical models with grease lubricated ball bearings.
- G. Control: Local disconnect switch.
- H. Capacity: Based on 65° F entering air temperature, 170° F average water temperature.

2.4 HYDRONIC RADIANT HEATERS

- A. Ceiling Panels: Constructed of linear extruded aluminum panels manufactured and assembled to sizes and configurations indicated.
- B. Pipe Coil: 24 inch wide aluminum panel sections to incorporate continuous ½ inch copper pipe thermally bonded spaced on 6" centers along width of panel. Provide return bends for two water connections to each panel.
- C. Provide panels for mounting on ceiling with enclosure as indicated on plans.
- D. Cross brace entire assembly with structural members and insulate with one inch thick fiberglass insulation with FSK backing.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as instructed by the manufacturer.
- B. Verify that required utilities are available, in proper location, and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Locate baseboard radiation on outside walls and run cover continuously wall-to-wall unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units butt against walls.
- C. All access doors installed in casework shall be approved by the architect and engineer before installation. Where fintube is installed behind casework locate balance, isolation and control valves above suspended ceilings or in other readily accessible locations. If access doors are required coordinate locations with architect so as to minimize modifications to the casework. Wherever possible install access doors in the backs of cabinets behind shelves and/or drawers. Provide adequate working space around access doors.
- D. Hang unit heaters from building structure, with pipe hangers anchored to building, not from piping. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- E. Install cabinet unit heaters as indicated. Coordinate to assure correct recess size for recessed units.
- F. Protect units with protective covers during balance of construction.
- G. Provide hydronic units with shut-off valve on supply and lockshield balancing valve on return piping. If not easily accessible, extend vent to exterior surface of cabinet for easy servicing. For cabinet unit heaters, fan coil units, and unit heaters, provide float operated automatic air vents with stop valve.

3.3 CLEANING

- A. Clean work under provisions of Division 01.
- B. After construction is completed, including painting, clean exposed surfaces of units. Vacuum clean coils and inside of cabinets.
- C. Touch-up marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer.
- D. Install new filters.

END OF SECTION 23 26 00

SECTION 23 31 00
HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct Materials.
2. Single Wall Spiral Round Ducts.

1.2 RELATED SECTIONS

- A. Division 03 - Cast-In-Place Concrete: Product requirements for concrete for placement by this section.
- B. Division 09 - Painting and Coating: Execution requirements for Weld priming, weather resistant, paint or coating specified by this section.
- C. Division 11 - Foodservice Equipment: Product requirements for kitchen range hoods for placement by this section.
- D. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment: Product requirements for hangers, supports and sleeves for placement by this section.
- E. Section 23 07 00 – HVAC Insulation: Product requirements for duct liners for placement by this section.
- F. Section 23 33 00 - Air Duct Accessories: Product requirements for duct accessories for placement by this section.

1.3 REFERENCES

A. ASTM International:

1. ASTM A36/A36M - Standard Specification for Carbon Structural Steel.
2. ASTM A90/A90M - Standard Test Method for Weight Mass of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
3. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
4. ASTM A568/A568M - Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.

5. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
6. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
7. ASTM A1011/A1011M - Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
8. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
9. ASTM C14 - Standard Specification for Concrete Sewer, Storm Drain, and Culvert Pipe.
10. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
11. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. National Fire Protection Association:

1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
2. NFPA 90B - Standard for the Installation of Warm Air Heating and Air Conditioning Systems.
3. NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

C. Sheet Metal and Air Conditioning Contractors:

1. SMACNA - Fibrous Glass Duct Construction Standards.
2. SMACNA - HVAC Air Duct Leakage Test Manual.
3. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

D. Underwriters Laboratories Inc.:

1. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

- A. Variation of duct configuration or sizes other than those of equivalent or lower loss coefficient is not permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 SUBMITTALS

- A. See General Conditions and the General Requirements in Division 01 regarding submittals.

1.6 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.

- B. Project Record Documents: Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and flexible.
- B. Construct ductwork to NFPA 90A standards.
- C. Maintain one copy of each document on site.

1.8 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 - Product Requirements.
- B. Do not install duct sealant when temperatures are less than those recommended by sealant manufacturers.
- C. Maintain temperatures during and after installation of duct sealant.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

PART 2 - PRODUCTS

2.1 DUCT MATERIALS

- A. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G90 zinc coating of in conformance with ASTM A90/A90M.
- B. Steel Ducts: ASTM A568/A568M.
- C. Fasteners: Rivets, bolts, or sheet metal screws.
- D. Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

2.2 LOW PRESSURE DUCTWORK FABRICATION

- A. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide airfoil turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30° divergence upstream of equipment and 45° convergence downstream.
- E. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- F. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.
- G. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- H. Connect flexible ducts to metal ducts with draw bands.
- I. Use crimp joints with or without bead for joining round duct sizes 12" and smaller with crimp in direction of airflow.
- J. Use double nuts and lock washers on threaded rod supports.

2.3 SINGLE WALL SPIRAL ROUND DUCTS

- A. Manufacturers:
 - 1. McGill AirFlow Corporation
 - 2. Spiral Mfg. Co., Inc.
 - 3. Semco Incorporated.
 - 4. Tangent Air Corp] Model.
 - 5. Local Manufacturer.
 - 6. Substitutions: Division 01 - Product Requirements.
- B. Product Description: UL 181, Class 1, round spiral lockseam duct constructed of galvanized steel.

- C. Duct Coating: Polyvinyl chloride plastic, 4 mil thick on Temperature range: minus 30°F to 200°F.

- D. Construct duct with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	26

- E. Construct fittings with the following minimum gages:

Diameter	Gauge
3 inches to 14 inches	24

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify sizes of equipment connections before fabricating transitions.

3.2 INSTALLATION

- A. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- B. Install glass fiber ducts in accordance with SMACNA Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- C. During construction, install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- D. Use crimp joints with or without bead or beaded sleeve couplings for joining round duct sizes 12" and smaller.
- E. Install duct hangers and supports in accordance with Section 23 05 00.
- F. Use double nuts and lock washers on threaded rod supports.
- G. Slope underground ducts to plenums or low pump out points at 1: 500. Install access doors for inspection.
- H. Paint buried metal ductwork without factory jacket with one coat and seams and joints with additional coat of asphalt base protective coating.

- I. Connect flexible ducts to metal ducts with [adhesive.] [liquid adhesive plus tape.] [draw bands.] [adhesive plus sheet metal screws.]
- J. Set plenum doors 6 to 12 inches above floor. Arrange door swing so fan static pressure holds door in closed position.
- K. Casings: Install floor mounted casings on 4" high concrete curbs. Refer to Section 03 30 00. At floor, rivet panels on 8 inch centers to angles. Where floors are acoustically insulated, furnish liner of 18 gage galvanized expanded metal mesh supported at 12 inch centers, turned up 12 inches at sides with sheet metal shields.
- L. Install kitchen range hoods in accordance with NFPA 96. Refer to Section 11 40 00.
- M. Install residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out.
- N. Kitchen hood exhaust ducts: Use stainless steel for ductwork exposed to view and stainless steel or carbon steel where ducts are concealed.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Install openings in ductwork where required to accommodate thermometers and controllers. Install pitot tube openings for testing of systems. Install pitot tube complete with metal can with spring device or screw to prevent air leakage. Where openings are provided in insulated ductwork, install insulation material inside metal ring.
- B. Connect diffusers or light troffer boots to low pressure ducts with 5 feet maximum length of flexible duct held in place with strap or clamp.
- C. Connect [air terminal units] [air outlets and inlets] to supply ducts [directly or] with five foot maximum length of flexible duct. Do not use flexible duct to change direction.

3.4 SCHEDULES

- A. Ductwork Material Schedule:

Air System	Material
Low Pressure Supply	Steel
Return and Relief	Steel
General Exhaust	Steel

END OF SECTION 23 31 00

SECTION 23 33 00
AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Duct Access Doors.
2. Fire Dampers.
3. Volume Control Dampers.
4. Duct Test Holes.
5. Turning Vanes.
6. Flexible Duct Connections.
7. Control Dampers.

1.2 RELATED SECTIONS

- A. Section 23 31 00 - HVAC Ducts and Casings: Requirements for duct construction and pressure classifications.
- B. Division 26 - Equipment Wiring Connections: Execution requirements for connection of electrical Combination Smoke and Fire Dampers specified by this section.

1.3 REFERENCES

- A. Air Movement and Control Association International, Inc.:
1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.
- B. ASTM International:
1. ASTM E1 - Standard Specification for ASTM Thermometers.
- C. National Fire Protection Association:
1. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.
- D. Sheet Metal and Air Conditioning Contractors:
1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- E. Underwriters Laboratories Inc.:

1. UL 555 - Standard for Safety for Fire Dampers.

1.4 SUBMITTALS

- A. Division 01 - Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers and duct access doors.
- C. Product Data: Submit data for shop fabricated assemblies and hardware used.
- D. Product Data: Submit for the following. Include where applicable electrical characteristics and connection requirements.
 1. Fire dampers including locations and ratings.
 2. Flexible duct connections.
 3. Volume control dampers.
 4. Duct access doors.
 5. Duct test holes.
- E. Product Data: For fire dampers:
 1. Include UL ratings, dynamic ratings, leakage, pressure drop and maximum pressure data.
 2. Indicate materials, construction, dimensions, and installation details.
 3. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- F. Manufacturer's Installation Instructions: Submit for Fire Dampers.
- G. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of access doors and test holes.

1.6 QUALITY ASSURANCE

- A. Dampers tested, rated and labeled in accordance with the latest UL requirements.
- B. Damper pressure drop ratings based on tests and procedures performed in accordance with AMCA 500.
- C. Maintain one copy of each document on site.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 - Product Requirements: Product storage and handling requirements.
- B. Protect dampers from damage to operating linkages and blades.
- C. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly indicating manufacturer and material.
- D. Storage: Store materials in a dry area indoor, protected from damage.
- E. Handling: Handle and lift dampers in accordance with manufacturer's instructions. Protect materials and finishes during handling and installation to prevent damage.

1.9 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.10 COORDINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work where appropriate with building control Work.

1.11 WARRANTY

- A. Division 01 - Execution and Closeout Requirements: Product warranties and product bonds.

1.12 EXTRA MATERIALS

- A. Division 01 - Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish two of each size and type of fusible link.

1.13 COMPLETION REQUIREMENTS

- A. In accordance with the General Conditions and the General Requirements in Division 01, Project Closeout; before acceptance and final payment, the Contractor shall furnish:

1. Accurate project record drawings, shown in red ink on prints, showing all changes from the original plans made during installation of the work.
2. Contractors One Year Warranty.
3. All Manufacturers' Guarantees.
4. Operation and Maintenance Manuals.

PART 2 - PRODUCTS

2.1 FIRE DAMPERS – ACCEPTABLE MANUFACTURERS.

- A. Ruskin.
- B. Greenheck.
- C. Pottorff.
- D. Substitutions: Division 01 - Product Requirements.

2.2 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A AND UL 555, and shall be dynamic type.
- B. Fire Resistance: 2 hours in accordance with UL 555.
- C. Fabricate curtain type dampers of galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations. Configure with blades out of air stream except for low pressure ducts up to 12 inches in height.

2.3 VOLUME CONTROL DAMPERS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Fabricate splitter dampers of material same gauge as duct to 24 inches size in either direction, and two gauges heavier for sizes over 24 inches.
- C. Fabricate splitter dampers of single thickness sheet metal to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- D. Fabricate single blade dampers for duct sizes to 9-1/2 x 30 inch.
- E. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inch. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.

- F. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- G. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends. Where volume dampers are located above gypsum or other non-accessible ceilings, extend damper rods to ceiling and install recessed concealed regulator with adjustable cover for flush installation, with cover. Exposed portions shall be chrome plated. Regulator shall include spring washer, lock nut, coupling, ninety degree screw or gear drive and rod as required, Young Regulator or equal. Coordinate location of access covers with Architect.
- H. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.

2.4 FLEXIBLE DUCT CONNECTIONS

- A. Manufacturers:
 - 1. Duro-Dyne.
 - 2. Substitutions: Division 01 - Product Requirements.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards, and as indicated.
- C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 3 inches wide, crimped into metal edging strip.
- D. Leaded vinyl sheet, minimum 0.55 inch thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

2.5 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.6 TURNING VANES

- A. Double Width: Air foil design double width galvanized turning vanes with 2 inch inside radius.
- B. Single Width: Single galvanized turning vane with 2 inch radius and minimum 1" trailing straight leg.
- C. Acoustical Vanes: Double width vanes with inner vane of perforated galvanized steel with 3/32 inch holes on 5/32 inch spacing. Fill space between vanes with minimum 1.5 lb/cu ft glass fiber duct liner.

2.7 CONTROL DAMPERS – ACCEPTABLE MANUFACTURERS

A. Manufacturers:

1. Ruskin.
2. Greenheck.
3. Tamco.
4. Substitutions: Division 01 – Product Requirements.

2.8 CONTROL DAMPERS

- A. Multi-blade, opposed blade action, control dampers of extruded aluminum, with airfoil type blades of maximum six inch width, blades positioned across short air opening dimension, field replaceable extruded vinyl sealed edges, linked together in rattle-free manner, non-corrosive molded synthetic bearings, square or hexagonal axles for positive locking connection to blades and linkage, with documented leakage rate not to exceed 6 CFM/sq. ft. at 4" W.G.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 - Administrative Requirements: Coordination and project conditions.
- B. Verify rated walls are ready for fire damper installation.
- C. Verify ducts and equipment installations are ready for accessories.
- D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.

3.2 INSTALLATION.

- A. Install in accordance with NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Install back-draft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C. Access Doors: Install access doors at the following locations and as indicated:
1. Before and after each duct mounted coil.
 2. Before and after each automatic control damper.
 3. Before and after each fire damper

- D. Access Door Sizes: Install minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Install 4 x 4 inch for balancing dampers only. Review locations prior to fabrication.
- E. Install temporary duct test holes as required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- F. Install fire dampers, at locations as indicated on Drawings. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
 - 1. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92A.
 - 2. Install dampers square and free from racking with blades running horizontally.
 - 3. Do not compress or stretch damper frame into duct or opening.
 - 4. Handle damper using sleeve or frame. Do not lift damper using blades, actuator, or jack shaft.
 - 5. Install bracing for multiple section assemblies to support assembly weight and to hold against system pressure. Install bracing as needed.

3.3 DEMONSTRATION

- A. Division 01 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Demonstrate re-setting of fire dampers to Government's representative.

END OF SECTION 23 33 00

SECTION 23 34 00

HVAC FANS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Forward curved centrifugal fans.
- B. Square In-line Centrifugal Fans.
- C. Motors and drives
- D. Discharge dampers.
- E. Belt guards.
- F. Inlet/outlet screens.
- G. Access doors.
- H. Scroll drains.

1.2 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC
- B. Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC
- C. Section 23 07 00 - HVAC Insulation
- D. Section 23 09 00 - HVAC Instrumentation
- E. Section 23 31 00 - HVAC Ducts and Casings
- F. Section 23 33 00 - Ductwork Accessories
- G. Section 23 37 00 - Air Outlets and Inlets

1.3 REFERENCES

- A. AMCA 99 - Standards Handbook.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes

- C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
- D. AMCA 301 - Method of Calculating Fan Sound Ratings from Laboratory Test Data.
- E. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- F. ANSI/AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- G. SMACNA - Low Pressure Duct Construction Standard.

1.4 QUALITY ASSURANCE

- A. Performance Ratings: Conform to AMCA 210 and bear the AMCA Certified Rating Seal.
- B. Sound Ratings: AMCA 301, tested to AMCA 300, and bear AMCA Certified Sound Rating Seal.
- C. Fabrication: Conform to AMCA 99.

1.5 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01.
- B. Provide product data on centrifugal fans and accessories as required for the work.
- C. Provide fan curves with specified operating point clearly plotted.
- D. Submit sound power levels for both fan inlet and outlet at rated capacity.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect motors, shafts, and bearings from weather and construction dust.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Greenheck.
- B. Cook.
- C. Penn Barry.
- D. Substitutions: Under provisions of Division 01.

2.2 FORWARD CURVED CENTRIFUGAL FANS

- A. Construction: The fan wheel housing and integral outlet duct shall be injection molded from a specially engineered resin exceeding UL requirements for smoke and heat generation. The outlet duct shall have provision for an aluminum backdraft damper with continuous aluminum hinge rod. The inlet box shall be minimum 22 gauge galvanized steel. Motor shall be isolation mounted to a one piece galvanized stamped steel integral motor mount/inlet. A field wiring compartment with disconnect receptacle shall be standard. To accommodate different ceiling thickness, an adjustable prepunched mounting bracket shall be provided. A white, high impact styrene injection molded grill shall be provided as standard. Unit shall be designed with provision for field conversion from ceiling to in-line. Unit shall be shipped in ISTA Certified Transit Tested Packaging.
- B. Wheel: Centrifugal forward curved type, injection molded of polypropylene resin. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- C. Motor: Open drip proof type with permanently lubricated bearings and include impedance or thermal overload protection and disconnect plug. Motor shall be furnished at the specified voltage.
- D. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA Certified Ratings Seal for Sound and Air Performance.

2.3 SQUARE INLINE CENTRIFUGAL FANS

- A. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency.
- B. Housing: The fan shall be of bolted construction utilizing corrosion resistant fasteners. Housing shall be minimum 18 gauge galvanized steel with integral duct collars. Bolted access doors shall be provided on three sides, sealed with closed cell neoprene gaskets. Pivoting motor plate

shall utilize threaded L-bolt design for positive belt tensioning. Housing shall be pre-drilled to accommodate universal mounting feet for vertical or horizontal installation.

- C. Coating: All steel fan components shall be coated with an electrostatically applied, baked polyester powder coating. Each component shall be subject to a five stage environmentally friendly wash system, followed by a minimum 2 mil thick baked powder finish. Paint must exceed 1,000 hour salt spray under ASTM B117 test method.
- D. Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.
- E. Bearings: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.
- F. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150% of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.
- G. Belt Guard: Fabricate to SMACNA Low Pressure Duct Construction Standard; of 12 gauge, 3/4 inch diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place

2.4 ACCESSORIES

- A. Discharge Dampers: Opposed blade heavy duty steel damper assembly with blades constructed of two plates formed around and welded to shaft, channel frame, sealed ball bearings, with blades linked out of air stream to single control lever.
- B. Inlet/Outlet Screens: Galvanized steel welded grid.
- C. Access Doors: Shaped to conform to scroll with quick opening latches and gaskets.
- D. Scroll Drain: 1/2 inch steel pipe coupling welded to low point of fan scroll.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Do not operate fans for any purpose until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
- B. Install fans as specified, with resilient mountings and flexible electrical leads.

- C. Install flexible connections specified in Section 23 33 00 between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- D. Install fan restraining snubbers. Flexible connectors shall not be in tension while running.
- E. Provide sheaves required for final air balance.
- F. Provide safety screen where inlet or outlet is exposed.
- G. Pipe scroll drains to nearest floor drain.
- H. Provide backdraft dampers on discharge of exhaust fans and as indicated.

END OF SECTION 23 34 00

SECTION 23 37 00
AIR OUTLETS AND INLETS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Registers/grilles.

1.2 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
- C. ANSI/NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- D. ARI 650 - Air Outlets and Inlets.
- E. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- F. SMACNA - HVAC Duct Construction Standard.

1.3 QUALITY ASSURANCE

- A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate performance of louvers in accordance with AMCA 500.

1.4 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 90A.
- B. Earthquake tabs, in seismic zones, in accordance with IBC Standards.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Provide product data for items required for this project.

- C. Review requirements of outlets and inlets as to size, finish, and type of mounting prior to submitting product data.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – GRILLES

- A. Titus.
- B. Krueger.
- C. Price.
- D. Substitutions: Under provisions of Division 01.

2.2 LINEAR GRILLES

- A. Streamlined blades with 0 degree deflection, 1/8 x 3/4 inch on 1/4 inch centers, “pencil proof”.
- B. Fabricate of aluminum extrusions, with factory baked enamel off-white finish.
- C. Fabricate 1-1/4 inch margin frame with countersunk screw mounting and gasket.

2.3 RETURN GRILLES

- A. Streamlined blades, depth of which exceeds 3/4 inch spacing, with spring or other device to set blades, horizontal face.
- B. Fabricate 1-1/4 inch margin frame with countersunk screw mounting.
- C. Fabricate of steel with 20 gauge minimum frames and 22 gauge minimum blades, steel and aluminum with 20 gauge minimum frame, or aluminum extrusions, with factory baked enamel off-white finish

2.4 AIR INLETS AND OUTLETS - SCHEDULE

- A. Refer to air inlet outlet schedules on mechanical drawings for basis of design model numbers. Provide specified model and accessories or equivalent product from the acceptable manufacturers listed.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install items in accordance with manufacturers' instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register assembly.
- D. Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION 23 37 00

SECTION 23 52 23
CAST IRON BOILERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Boilers.
- B. Controls and Boiler Trim.
- C. Hot Water Connections.
- D. Fuel Connection.
- E. Power Vent Kit.
- F. Vent Stack.
- G. Combustion Air Duct.
- H. Circulator.

1.2 RELATED SECTIONS

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 05 16 - Expansion Fittings and Loops for HVAC Piping.
- C. Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
- D. Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping, Ductwork and Equipment.
- E. Section 23 05 53 - Identification for HVAC Piping, Ductwork and Equipment.
- F. Section 23 08 00 - Commissioning of HVAC.
- G. Section 23 09 00 - Instrumentation.
- H. Section 23 09 23 - Sequence of Operation.
- I. Section 23 21 13 - Hydronic Piping.
- J. Section 23 21 16 - Hydronic Piping Specialties.

K. Section 23 51 00 – Breechings Chimneys and Stacks.

L. Section 26 05 03 - Equipment Wiring Connections.

1.3 REFERENCES

- A. AGA - Directory of Certified Appliances and Accessories.
- B. ANSI/AGA Z21.13 - Gas-Fired Low-Pressure Steam and Hot Water Boilers.
- C. ANSI/AGA Z223.1 - National Fuel Gas Code.
- D. ANSI/ASME SEC4 - Boiler and Pressure Vessel Codes - Rules for Construction of Heating Boilers.
- E. ANSI/ASME SEC8D - Boilers and Pressure Vessel Codes - Rules for Construction of Pressure Vessels.
- F. ANSI/NFPA 70 - National Electrical Code.
- G. ANSI/UL 726 - Oil-Fired Boiler Assemblies.
- H. HI (Hydronics Institute) - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

1.4 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Submit product data indicating gross input/output, I-B-R net rating, fuel type, electrical requirements, accessories, trim, controls, general layout, dimensions, and size and location of connections.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include manufacturer's descriptive literature, operating instructions, cleaning procedures, replacement parts list, and maintenance and repair data.

1.6 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years' experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70 code for internal wiring of factory wired equipment.
- B. Conform to ANSI/ASME SEC4 and SEC 8D for boiler construction.
- C. Units: UL labeled.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect units before, during, and after installation from damage to casing by leaving factory shipping packaging in place until immediately prior to final acceptance.

1.9 WARRANTY

- A. Provide one year pro-rated warranty under provisions of Division 01.
- B. Warranty: Include coverage for cast iron boiler sections.

PART 2 - PRODUCTS

2.1 BOILER MANUFACTURERS

- A. Energy Kinetics.
- B. Burnham.
- C. Weil McLain.
- D. Substitutions: Under provisions of Division 01.

2.2 MANUFACTURED UNITS

- A. Hot water boilers suitable for induced draft insulated jacket, steel spiral heat exchanger or cast iron sectional, oil burning system, refractory, controls, and boiler trim.

2.3 FABRICATION

- A. Assemble from cast iron sections with 30 psig ANSI/ASME Boilers and Pressure Vessels Code Rating.

- B. Provide clean-out and access doors, observation ports, and relief openings to flue passages.
- C. Provide structural base of aluminized steel lined with high temperature mineral fiber insulating panels.
- D. Provide glass fiber insulated steel jacket, finished with factory applied baked enamel.

2.4 HOT WATER BOILER TRIM

- A. Combination water pressure and temperature gauge, and ASME rated pressure relief valve, sized to boiler gross output.
- B. Low water cut-off with manual reset to automatically prevent burner operation when boiler water falls below safe level, with power failure automatic reset.
- C. Operating temperature controller with outdoor reset to maintain boiler water temperature.
- D. Electronic operating temperature controller with full cover for wall mounting, ambient temperature range - 30 to 150° F, adjustable reset ratio of outside air temperature change to discharge control point change 1:2 to 100:1, integral set point adjustment 80 to 230° F, electronic primary and outdoor sensors, for on-off switching of pilot duty single throw double pole relays.
- E. Redundant high limit temperature controller for burner to prevent boiler water temperature from exceeding safe system temperature.
- F. Boiler air vent.

2.5 FUEL BURNING SYSTEM

- A. Burner Operation: On-off with low fire position for ignition.
- B. Oil Burner: High pressure atomizing type for No. 2 oil with combustion air blower, fuel pump, hinged flame inspection port, cadmium sulfide flame sensor, electrodes, ignition transformer, and oil nozzle. Provide with air box kit for direct connection to combustion air ductwork.
- C. Oil Burner Safety Controls: Energize burner motor and electric ignition, limit time for establishment of main flame, monitor flame continuously during burner operation and stop burner on flame failure with manual reset necessary, solenoid oil delay valve opens after burner motor energized and closes when de-energized.
- D. Controls: Pre-wired, factory assembled electronic controls in control cabinet with flame scanner or detector, programming control, relays, and switches. Provide pre-purge and post-purge ignition and shut-down of burner in event of ignition pilot and main flame failure with manual reset.

2.6 PERFORMANCE

- A. Performance rating shall be in accordance with HI - Testing and Rating Standard for Cast Iron and Steel Heating Boilers.

2.7 POWER VENT KIT

- A. Description: Combined boiler vent and combustion air intake with induction fan intended for sidewall mounting. Interior vent pipe surrounded by combustion air sleeve, each connected to concentric outlet/inlet hood assembly on the building exterior.
- B. Construction: Stainless steel vent and combustion air ducts and concentric hood assembly, induction fan with metal housing and centrifugal wheel. Rated for zero clearance to combustibles when installed per manufacturer.

2.8 VENT STACK

- A. AL29-4C, UL641 listed for use under positive or negative pressure with fuel oil. Stainless steel construction, fittings with gasketed seals and locking bands.
- B. Other materials as recommended/provided by manufacturer.

2.9 COMBUSTION AIR DUCT

- A. ABS Schedule 40 Cellular Core (Foam Core) Pipe: Pipe and fittings shall be manufactured from ABS compound with a cell class of 42222 for pipe and 32222 for fittings as per ASTM D 3965 and conform with National Sanitation Foundation (NSF) standard 14. ASTM D 2661 Fittings. Joints: ASTM D 2235 solvent welded.
- B. PVC Pipe: ASTM D2729. Fittings: PVC. Joints: ASTM D2855, solvent weld with ASTM D2564 solvent cement.

2.10 CIRCULATOR MANUFACTURERS

- A. Taco.
- B. Grundfos.
- C. Armstrong.
- D. Substitutions: Under provisions of Division 01.

2.11 CIRCULATORS

- A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for inline mounting, oil lubricated, for 125 psig maximum working pressure.
- B. Casing: Cast iron.
- C. Impeller: Cadmium plated steel, keyed to shaft.
- D. Bearings: Two, oil lubricated bronze sleeves.
- E. Shaft: Alloy steel with copper sleeve, integral thrust collar.
- F. Seal: Carbon rotating against a stationary ceramic seat, 225° F maximum continuous operating temperature.
- G. Drive: Flexible coupling.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide for connection to electrical service. Refer to Division 26, electrical.
- C. Provide connection of gas service in accordance with ANSI/AGA Z223.1.
- D. Pipe relief valves to nearest floor drain.
- E. Install circulator and diaphragm expansion tank on boiler.

3.2 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of Division 01. Instruct operating personnel.
- B. Submit written report after start-up including control settings and performance chart of control system.
- C. Provide boiler set-up and adjustment before firing. Submit results of combustion test prior to final acceptance, including: Overfire and flue collar draft, CO₂ (CO for gas), net stack temperature, smoke number, and percent efficiency. Tests are to be run by approved technician specializing in boiler maintenance.

END OF SECTION 23 52 23

SECTION 23 72 00

AIR TO AIR ENERGY RECOVERY EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Fixed Plate Air to Air Energy Recovery Ventilators
- B. Product Accessories and system components
- C. General Installation requirements

1.2 RELATED WORK

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 07 00 - HVAC Insulation.
- C. Section 23 09 33 - Instrumentation and Controls for HVAC.
- D. Section 23 31 00 - HVAC Ducts and Casings.
- E. Section 23 33 00 - Duct Accessories.
- F. Section 23 34 00 - HVAC Fans.
- G. Section 23 82 16 - Air Coils.
- H. Division 26 - Equipment Wiring Connections.

1.3 REFERENCES

- A. AHRI – Air-Conditioning, Heating, and Refrigeration Institute
- B. ANSI/NEMA MG 1 - Motors and Generators.
- C. ANSI/NFPA 90B - Installation of Warm Air Heating and Air Conditioning Systems.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01.

- B. Shop drawings shall indicate assembly, unit dimensions, weight loading, required clearances, construction details, and field connection details.
- C. Product data shall indicate dimensions, weights, capacities, ratings, fan performance, motor electrical characteristics, and gauges and finishes of materials. Contractor not to exceed unit dimensions specified in the contract documents.
- D. Provide fan curves with specified operating point clearly plotted.
- E. Submit sound power levels for both fan outlet and casing radiation at rated capacity.
- F. Submit product data of filter media, filter performance data, filter assembly, and filter frames.
- G. Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed and field-installed wiring.
- H. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 WARRANTY

- A. Provide ten year warranty on the core and two year warranty on all other components.

1.6 QUALITY ASSURANCE

- A. Unit shall be certified under UL-1812, Standard for Ducted Air to Air Heat Exchangers. Specific UL-1812 Listing Standards for outdoor units including rain testing, UV exposure testing, corrosion resistance and temperature extremes testing shall be required for these models. Due to ongoing product offerings and upgrades, some models and options are not included in UL Listing reports. Consult American ALDES for more information.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include instructions for lubrication, filter replacement, motor and drive replacement, spare parts lists, and wiring diagrams.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01 in factory-fabricated protective containers, with factory-installed shipping skids and lifting lugs.
- B. Store and protect products under provisions of Division 01.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – HEAT RECOVERY VENTILATORS

- A. American Aldes.
- B. Substitutions: Under provisions of Division 01.

2.2 HEAT RECOVERY VENTILATORS

- A. Fully packaged heat recovery ventilation unit, horizontally ducted, fully removable polypropylene core, supply fan, exhaust fan, filters, control dampers, single point electrical connection and packaged controls from manufacturer.
- B. Unit Casing
 - 1. The casing shall be double wall heavy gauge steel with minimum 1” insulation between interior and exterior panels.
 - 2. The exterior casing shall be coated with a satin enamel paint finish.
 - 3. All interior surfaces of the casing shall be minimum 22 Gauge galvanized steel with no screw penetrations from the exterior of the unit. All surfaces shall be smooth to ensure easy cleaning.
 - 4. Integral pan drains for condensation removal.
- C. Heat Exchanger Core
 - 1. Polypropylene construction, suitable for sensible heat recovery.
- D. Blowers
 - 1. Blowers shall be centrifugal type, with forward curved impeller blades, and include permanently sealed and lubricated ball bearings.
 - 2. The blower and motor assembly shall be dynamically balanced at the factory to minimize vibration.
 - 3. Blowers shall be mounted to the housing using anti-vibration isolators.
 - 4. Drive: belt and variable pulley.
- E. Motors
 - 1. The motor shall be open drip-proof inverter-duty 10:1.
 - 2. Motors greater than 1.5 HP shall be Premium Efficiency as standard.
 - 3. The motor shall include permanently lubricated sealed bearings, and equipped with

- automatic reset thermal overload protection.
4. The exhaust and supply air shall be delivered independently with its own motor and blower.
 5. Motors shall be equipped with variable speed drives when specified. VFDs will be controlled by a 0-10VDC source provided by others.

F. Controls

1. A low voltage 24VAC transformer shall be supplied to provide power for external control component contacts.
2. Dry contacts for occupancy control, ventilation control, fan interlock, dirty filter alarm, low airflow limit switch, and low temperature switch shall be provided as specified in the project schedule.
3. Access door shall include a non-fused NEMA 4 disconnect switch.
4. Defrost cycle shall be exhaust only, recirculation, face bypass damper, or preheat frost prevention as specified in the project schedule.

G. Electrical

1. The fans shall operate on 115 V, single phase, 60 Hz or 208, 230, 460, or 575V, three phase, 60 Hz current, as specified in the project schedule.
2. Units shall be single point power connection.

H. Capacities

1. The heat recovery ventilator shall be properly sized per performance schedule. Contractor shall size unit in accordance with manufacturer's sizing recommendations/instructions.

I. Filters

1. Exhaust airflows shall be filtered before they pass through the heat recovery core. The exhaust air shall be filtered through a unit integral MERV 8 rated filter.
2. Supply airflows shall be filtered before they pass through the heat recovery core. The supply air shall be filtered through a unit integral MERV 8 rated filter.

J. Dampers

1. Supply air intake shall include an insulated aluminum profile damper activated by servomotor.
2. Exhaust air discharge shall include an insulated aluminum profile damper activated by servomotor.

K. Serviceability

1. The equipment shall have one side access to all working components. This access shall be provided by a hinged, fully insulated and gasketed door per project details. Doors shall include ¼ turn handle access.
2. Heat recovery core, filters, and blowers shall be fully removable without disassembling internal partitions or attached duct.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install equipment in accordance with manufacturer's installation instructions and in accordance with Project Details.
- B. Secure air handler to structure seismic restraint, in accordance with Section 23 05 00.

END OF SECTION 23 72 00

SECTION 23 82 16

AIR COILS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water Coils.

1.2 RELATED SECTIONS

- A. Section 23 05 00 - Common Work Results for HVAC.
- B. Section 23 07 00 - HVAC Insulation.
- C. Section 23 09 33 - Instrumentation and Controls for HVAC.
- D. Section 23 31 00 - HVAC Ducts and Casings.
- E. Section 23 33 00 - Duct Accessories.
- F. Section 23 34 00 - HVAC Fans.
- G. Section 23 72 00 - Air to Air Energy Recovery Equipment.

1.3 REFERENCES

- A. ANSI/ARI 410 - Forced-Circulation Air-Cooling and Air- Heating Coils.
- B. ANSI/NFPA 70 - National Electrical Code.
- C. ANSI/UL 1096 - Electric Central Air Heating Equipment.
- D. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.

1.4 SUBMITTALS

- A. Submit shop drawings under provisions of Division 01.
- B. Submit shop drawings indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- C. Submit product data under provisions of Division 01.

- D. Submit product data indicating coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
- E. Submit manufacturer's installation instructions under provisions of Division 01.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum three years' experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Store and protect products under provisions of Division 01.
- C. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.
- D. Protect coils from entry of dirt and debris with pipe caps or plugs.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - HYDRONIC COILS

- A. Luvata.
- B. Trane.
- C. Pace.
- D. Carrier.
- E. York.
- F. Substitutions: Under provisions of Division 01.

2.2 WATER HEATING COILS

- A. Tubes: 5/8 inch OD seamless copper or brass arranged in parallel or staggered pattern, expanded into fins, brazed joints.
- B. Fins: Aluminum or copper continuous plate type with full fin collars or individual helical finned tube type wound under tension. Solder coat copper fin coils.

- C. Casing: Die formed channel frame of 14 gauge galvanized steel with 3/8 inch mounting holes on 6 inch centers. Provide tube supports for coils longer than 36 inches.
- D. Capacity: As scheduled.
- E. Headers: Cast iron with tubes expanded into header, seamless copper tube with silver brazed joints, or prime coated steel pipe with brazed joints.
- F. Testing: Air test under water to 200 psig for working pressure of 200 psig and 220° F.
- G. Configuration: Drainable, with threaded plugs in headers for drain and vent; threaded plugs in return bends and in headers opposite each tube.
- H. Fin Spacing: 8 fins per inch.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- C. Support coil sections independent of piping on steel channel or double angle frames and secure to casings. Provide frames for maximum three coil sections. Arrange supports to avoid piercing drain pans. Provide airtight seal between coil and duct or casing.
- D. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
- E. Install coils level.
- F. Make connections to coils with unions and flanges.
- G. On water coils, provide shut-off valve on supply line and lockshield balancing valve on return line. Locate water supply at bottom of supply header and return water connection at top. Provide float operated automatic air vents at high points complete with stop valve. Ensure water coils are drainable and provide drain connection at low points.

END OF SECTION 23 82 16

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. General Requirements specifically applicable to Division 26, in addition to Division 01 provisions.
- B. The electrical system equipment and installation shall comply with all provisions and requirements of this specification, as well as any and all applicable national, state and local codes and standards.

1.2 WORK SEQUENCE

- A. Construct Work in sequence under provisions of Division 01.

1.3 COORDINATION

- A. Coordinate the Work specified in this Division under provisions of Division 01.
- B. Prepare drawings showing proposed rearrangement of Work to meet job conditions, including changes to Work specified under other Sections. Obtain permission of Architect prior to proceeding.

1.4 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code, latest adopted edition including all state and local amendments.
- B. NECA - Standard of Installation.
- C. NETA ATS – Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- D. Electrical Reference Symbols: The Electrical "Legend" on drawings is standardized version for this project. All symbols shown may not be used on drawings. Use legend as reference for symbols used on plans.
- E. Electrical Drawings: Drawings are diagrammatic; complimentary to the Architectural drawings; not intended to show all features of work. Install material not dimensioned on drawings in a manner to provide a symmetrical appearance. Do not scale drawings for exact equipment locations. Review Architectural, Civil, Structural, and Mechanical Drawings and

adjust work to conform to conditions shown thereon. Field verification of dimensions, locations and levels is directed.

1.5 REGULATORY REQUIREMENTS

- A. Conform to ANSI/NFPA 70.
- B. Conform to the latest adopted edition of the International Building Code and the International Fire Code including all state and local amendments thereto.
- C. Obtain electrical permits, plan review, and inspections from authority having jurisdiction.

1.6 SUBMITTALS

- A. Submit inspection and permit certificates under provisions of Division 01.
- B. Include certificate of final inspection and acceptance from authority having jurisdiction.
- C. Submittal review is for general design and arrangement only and does not relieve the Contractor from any requirements of Contract Documents. Submittal not checked for quantity, dimension, fit or proper operation. Where deviations of substitute product or system performance have not been specifically noted in the submittal by the Contractor, provisions of a complete and satisfactory working installation is the sole responsibility of the Contractor.
- D. In addition to requirements referenced in Division 01, the following is required for work provided under this division of the specification.
 - 1. Provide material and equipment submittals containing complete listings of material and equipment shown on Electrical Drawings and specified herein. Separate from work furnished under other divisions. Index and clearly identify all material and equipment by item, name or designation used on drawings and in specifications.
 - 2. Submit only pages which are pertinent; mark each copy of standard printed data to identify pertinent products, referenced to Specification Section and Article number. Show reference standards, performance characteristics, and capacities; wiring diagrams and controls; component parts; finishes; dimensions; and required clearances.
 - 3. Modify manufacturer's standard schematic drawings and diagrams to supplement standard information and to provide information specifically applicable to the work. Delete information not applicable.
 - 4. Review submittals prior to transmittal; determine and verify field measurements, field construction criteria, manufacturer's catalog numbers, and conformance of submittal with requirements of Contract Documents.
 - 5. Coordinate submittals with requirements of work and of Contract Documents.
 - 6. Certify in writing that the submitted shop drawings and product data are in compliance with requirements of Contract Documents. Notify Architect/Engineer in writing at time of submittal, of any deviations from requirements of Contract Documents.
 - 7. Do not fabricate products or begin work which requires submittals until return of submittal with Architect/Engineer acceptance.

8. Equipment scheduled by manufacturer's name and catalog designations, manufacturer's published data and/or specification for that item, in effect on bid date, are considered part of this specification. Approval of other manufacturer's item proposed is contingent upon compliance therewith.
9. Submittals for Division 26 shall be complete and submitted at one time. Unless given prior approval, partial submittals will be returned unreviewed.

1.7 SUBSTITUTIONS

- A. In accordance with the General Conditions and the General Requirements, Substitution and Product Options, all substitute items must fit in the available space, and be of equal or better quality including efficiency performance, size, and weight, and must be compatible with existing equipment.

1.8 PROJECT RECORD DRAWINGS

- A. Maintain project record drawings in accordance with Division 01.
- B. In addition to the other requirements, mark up a clean set of drawings as the work progresses to show the dimensioned location and routing of all electrical work which will become permanently concealed. Show routing of work in permanently concealed blind spaces within the building. Show complete routing and sizing of any significant revisions to the systems shown.
- C. Record drawing field mark-ups shall be maintained on-site and shall be available for examination of the Contracting Officer at all times.

1.9 OPERATION AND MAINTENANCE MANUALS

- A. Provide operation and maintenance manuals for training of Contracting Officer in operation and maintenance of systems and related equipment. In addition to requirements referenced in Division 01, the following is required for work provided under this section of the specifications.
- B. Manuals shall be separate from work furnished under other divisions. Prepare a separate chapter for instruction of each class of equipment or system. Index and clearly identify each chapter and provide a table of contents.
- C. Unless otherwise noted in Division 01, provide one copy of all material for approval.
- D. The following is the suggested outline for operation and maintenance manuals and is presented to indicate the extent of items required in manuals.
 1. List chapters of information comprising the text. The following is a typical Table of Contents:
 - a. Electrical power distribution.
 - b. Lighting.

- c. Fire alarm.
 - d. Other chapters as necessary.
- 2. Provide the following items in sequence for each chapter shown in Table of Contents:
 - a. Describe the procedures necessary for personnel to operate the system including start-up, operation, emergency operation and shutdown.
 - 1) Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable.
 - 2) Give step-by-step instructions for shutdown procedure if a particular sequence is required.
 - 3) Include test results of all tests required by this and other sections of the specifications.
 - b. Maintenance Instructions:
 - 1) Provide instructions and a schedule of preventive maintenance, in tabular form, for all routine cleaning and inspection with recommended lubricants if required for the following:
 - a) Lighting fixtures.
 - b) Distribution equipment.
 - c) Fire alarm and detection equipment.
 - 2) Provide instructions for minor repair or adjustments required for preventive maintenance routines, limited to repairs and adjustments which may be performed without special tools or test equipment and which requires no special training or skills.
 - 3) Provide manufacturers' descriptive literature including approved shop drawings covering devices used in system, together with illustrations, exploded views, etc. Also include special devices provided by the Contractor.
 - 4) Provide any information of a maintenance nature covering warranty items, etc., which have not been discussed elsewhere.
 - 5) Include list of all equipment furnished for project, where purchased, technical representative if applicable and a local parts source with a tabulation of descriptive data of all electrical-electronic spare parts and all mechanical spare parts proposed for each type of equipment or system. Properly identify each part by part number and manufacturer.

1.10 DEMONSTRATION OF ELECTRICAL SYSTEMS

A. During substantial completion inspection:

- 1. Conduct operating test for approval under provisions of Division 01.
- 2. Demonstrate installation to operate satisfactorily in accordance with requirements of Contract Documents.

3. Should any portion of installation fail to meet requirements of Contract Documents, repair or replace items failing to meet requirements until items can be demonstrated to comply.
4. Have instruments available for measuring light intensities, voltage and current values, and for demonstration of continuity, grounds, or open circuit conditions.
5. Provide personnel to assist in taking measurements and making tests.

1.11 WARRANTY

- A. In addition to the requirements of Division 01, or as specified in other sections. Warrant all materials, installation and workmanship for one (1) year from date of acceptance.
- B. Copies of manufacturer product warranties for all equipment shall be included in the operation and installation manuals.

1.12 INSTRUCTION OF OPERATING PERSONNEL

- A. In accordance with the requirements of Division 01 and this section provide services of qualified representative of supplier of each item or system listed below to instruct designated personnel of Contracting Officer in operation and maintenance of item or system.
- B. Make instruction when system is complete, of number of hours indicated, and performed at time mutually agreeable.

System or Equipment	Hours of Instruction
Fire alarm system	4
Modify/add other sections as necessary	

- C. Certify that an Anchorage or Seward based authorized service organization regularly carries complete stock of repair parts for listed equipment or systems, that organization is available and will furnish service within 48 hours after request. Include name, address and telephone number of service organization.
- D. Have approved operation and maintenance manuals and parts lists for all equipment on hand at time of instruction.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. All Materials and Equipment shall be new.
- B. All Materials and Equipment shall be listed by Underwriter's Laboratories or equivalent third party listing agency for the use intended.

- C. Materials and Equipment shall be acceptable to the authority having jurisdiction as suitable for the use intended when installed per listing and labeling instructions.
- D. No materials or equipment containing asbestos in any form shall be used. Where materials or equipment provided by this Contractor are found to contain asbestos such items shall be removed and replaced with non-asbestos containing materials and equipment at no cost to the Contracting Officer.
- E. In describing the various items of equipment, in general, each item will be described singularly, even though there may be numerous similar items.

PART 3 - EXECUTION

3.1 WORKMANSHIP

- A. Install Work using procedures defined in NECA Standard of Installation and/or the manufacturer's installation instructions.

3.2 TESTS

- A. Perform tests in accordance with Section 26 01 26 – Testing and Maintenance of Electrical Systems.
- B. Notify the Contracting Officer at least 72 hours prior to conducting any tests.
- C. Following completion of installation, test system ground in accordance with the requirements of NETA ATS 7.13. and all feeders in accordance with NETA ATS 7.3. Submit logs of values obtained, and nameplate data of instruments used prior to final inspection. Include a copy of all data in the power distribution section of the Operation and Maintenance Manuals.
- D. Perform additional tests required under other sections of these specifications.
- E. Perform all tests in the presence of the Contracting Officer.
- F. The Contractor shall provide written notification to the Contracting Officer and the State Electrical Inspector thirty days in advance of requests for rough-in and substantial completion inspections.

3.3 PENETRATIONS OF FIRE BARRIERS

- A. Related information to this section appears in Division 07, Fire Stopping.
- B. All holes or voids created to extend electrical systems through fire rated floors, walls or ceiling shall be sealed with an asbestos-free intumescent fire stopping material capable of expanding 8 to 10 times when exposed to temperatures 250°F or higher.

- C. Materials shall be suitable for the fire stopping of penetrations made by steel, glass, plastic and shall be capable of maintaining an effective barrier against flame, smoke and gases in compliance with the requirements of ASTM E814 and UL 1479.
- D. The rating of the fire stops shall be the same as the time-rated floor, wall or ceiling assembly.
- E. Install fire stopping materials in accordance with the manufacturer's instructions.
- F. Unless protected from possible loading or traffic, install fire stopping materials in floors having void openings of four (4) inches or more to support the same floor load requirements as the surrounding floor.

END OF SECTION 26 05 00

SECTION 26 05 05

SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electrical Demolition.

1.2 RELATED SECTIONS

- A. Division 01 - Alteration Project Procedures.
- B. Division 02 - Minor Demolition for Remodeling.

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 field measurements and circuiting arrangements are as shown on Drawings.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Architect/Engineer 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 scheduled for removal.
- B. Coordinate utility service outages with Utility Company.

- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Obtain permission from Contracting Officer at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Contracting Officer and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make temporary connections to maintain service in areas adjacent to work area.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of Division 01, Division 02, and this Division.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Where abandoned conduit is installed below existing slab not scheduled for demolition, remove the conductors, cut conduit flush with floor, and patch surface.
- F. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- G. Disconnect and remove abandoned panelboards and distribution equipment.
- H. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- I. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- J. Repair adjacent construction and finishes damaged during demolition and extension work. T-bar ceiling tiles damaged under normal construction conditions or having voids where junction boxes were removed shall be replaced by the Contractor.
- K. Maintain access to existing electrical installations which remain active.

- L. Extend existing installations using materials and methods as specified.
- M. Where materials or equipment are to be turned over to the Government or reused and installed by the Contractor, it shall be the Contractor's responsibility to maintain condition of materials and equipment equal to the existing condition of the equipment before the work began. Repair or replace damaged materials or equipment at no additional cost to the Government.

3.4 EXISTING PANELBOARDS

- A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers.
- B. Tag unused circuits as spare.
- C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.
- D. Remove existing wire no longer in use from panel to equipment.
- E. Provide new updated directories where more than three circuits have been modified or rewired.

3.5 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions.

3.6 INSTALLATION

- A. Install relocated materials and equipment under the provisions of Division 01.

END OF SECTION 26 05 05

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Building Wire.
- B. Cable.
- C. Wiring Connections and Terminations.

1.2 RELATED SECTIONS

- A. Section 26 01 26 – Maintenance Testing of Electrical Systems.
- B. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

- A. Federal Specification FS-A-A59544 – Cable and Wire, Electrical (Power, Fixed Installation).
- B. Federal Specification FS-J-C-30B – Cable Assembly, Power, Electrical.
- C. ANSI/NEMA WC 70-2009 – Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy.
- D. NETA ATS – Acceptance testing specifications for Electrical Power Distribution and Systems.
- E. NFPA 70 – National Electrical Code.
- F. NFPA 262 – Standard Method of test for flame travel and smoke of wires and cables for use in air-handling spaces.
- G. UL 62 – Flexible Cords and Cables.
- H. UL 83 – Thermoplastic Insulated Wire and Cable.
- I. UL 1063 – Standard for Machine and Tool Wire and Cable.
- J. UL 1424 – Standard for Cables for Power-Limited Fire Alarm.
- K. UL 1479 – Standard for Fire Tests of Through Wall Penetration Fire Stops.

- L. UL 1569 – Standard for Metal Clad Cable.
- M. UL 1581 – Reference Standard for Electrical Wires, Cables and Flexible Cords.

1.4 QUALITY ASSURANCE

- A. Provide wiring materials located in plenums with peak optical density not greater than 0.5, average optical density not greater than 0.15, and flame spread not greater than 5 feet (1.5m) when tested in accordance with NFPA 262.

1.5 SUBMITTALS

- A. Submit data under provisions of Division 01 and Section 26 05 00.
- B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

PART 2 - PRODUCTS

2.1 BUILDING WIRE

- A. Thermoplastic-insulated Building Wire: NEMA WC 5.
- B. Feeders and Branch Circuits Larger Than 6 AWG: Copper, stranded conductor, 600 volt insulation, THW, THHN/THWN or XHHW-2 as indicated.
- C. Feeders and Branch Circuits 6 AWG and Smaller: Copper conductor, 600 volt insulation, THHN/THWN or XHHW-2. 6 and 8 AWG, stranded conductor; smaller than 8 AWG, solid or stranded conductor.
- D. Branch Circuit Wire Color Code:
 - 1. Color code wires by line or phase as follows:
 - a. Black, red, blue and white for 120/208V systems.
 - 2. For conductors 6 AWG and smaller, insulation shall be colored. For conductors 4 AWG and larger, identify with colored phase tape at all terminals, splices, and boxes.
 - 3. Grounding conductors 6 AWG and smaller shall have green colored insulation. For 4 AWG and larger, use green tape at both ends and at all other visible points in between, including pull and junction boxes.
- E. Control Circuits: Copper, stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.
- F. Fire Alarm Notification Appliance Circuits: Copper, solid or stranded conductor 600 volt insulation, THHN/THNN or XHHW-2.

2.2 NONMETALLIC SHEATHED CABLE

- A. Nonmetallic Sheathed Cable, Size 12 through 4 AWG: Copper conductor, 600 volt insulation, rated 90° C in dry locations, Type NM-B.
- B. Branch Circuit Cable Size #12 through #6: Copper conductor, 600 volt insulation, rated 90° C in wet or dry locations, Type UF-B.

2.3 METAL CLAD CABLE

- A. UL 83, 1063, 1479, 1569, and 1581 listed, meets Federal Specification A-A-59544 (formerly J-C-30B). UL rated for installation in cable trays and environmental air handling spaces. Fire wall rated for 1, 2, and 3-hour through penetrations.
- B. Type MC Cable, Size 12 Through 10 AWG: Solid copper conductor, 600 volt thermoplastic insulation, rated 90° C dry, 75° wet, insulated green grounding conductor, and galvanized steel or aluminum armor over mylar.
- C. Type MC Cable, Size 8 Through 1 AWG: Stranded copper conductor, 600 volt thermoplastic insulation, rated 90° C dry, 75° wet, insulated green grounding conductor, and galvanized steel or aluminum armor over mylar.
- D. Fire Alarm/Control Type MC Cable, Size 18 through 12 AWG: Complying with UL 66, 83, 1424, 1479, 1569, 1581, and NFPA 262 (formerly UL 910), solid copper conductor, 300 volt thermoplastic insulation, rated 105° C, insulated green grounding conductor, and red-striped galvanized steel armor over mylar. Conductor insulation shall be color-coded in accordance with Section 28 31 00.
- E. All metal clad cable shall be provided with color-coded insulation on all ungrounded conductors in accordance with NEC 210.5(C) and Part 3 of this section.

2.4 REMOTE CONTROL AND SIGNAL CABLE

- A. Control Cable for Class 1 Remote Control and Signal Circuits: Copper conductor, 600 volt insulation, rated 90° C, individual conductors twisted together, shielded, and covered with an overall PVC jacket; UL listed.
- B. Control Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90° C, individual conductors twisted together and covered with a PVC jacket; UL listed.
- C. Plenum Cable for Class 2 or Class 3 Remote Control and Signal Circuits: Copper conductor, 300 volt insulation, rated 90° C, individual conductors twisted together and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.5 WIRING CONNECTIONS AND TERMINATIONS

A. For conductors 8 AWG and smaller:

1. Dry interior areas: Spring wire connectors, pre-insulated "twist-on" rated 105 degrees C per UL 468C. Where stranded conductors are terminated on screw type terminals, install crimp insulated fork or ring terminals. Thomas & Betts Sta-Kon or equal.
2. Motor connections: Spring wire connectors, pre-insulated "twist-on" rated 105 degrees C per UL 468C. Provide a minimum of 8 wraps of Scotch 33+ electrical tape around conductors and connector to eliminate connector back off.
3. Wet or exterior: Spring wire connectors, pre-insulated "twist-on", resin filled rated for direct burial per UL 486D.

B. For conductors 6 AWG and larger:

1. Bus lugs and bolted connections: 600 V, 90 degrees C., two hole long barrel irreversible compression copper tin plated. Thomas & Betts or approved equal.
2. Motor connection: 600 V, 90 degrees C., copper tin plated compression motor pigtail connector, quick connect/disconnect, slip on insulator. Thomas & Betts or approved equal.
3. Two way connector for splices or taps: 600 V, 90 degrees C., compression long barrel, copper tin plated. Thomas & Betts or approved equal. Insulate with Scotch 23 rubber insulating base covering and Scotch 33+ outer wrap.

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS

- A. Use no wire smaller than 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring.
- B. Use 10 AWG conductor for 20 ampere, 120 volt branch circuit home runs longer than 75 feet.
- C. Splice only in junction or outlet boxes.
- D. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- E. Make Conductor lengths for parallel circuits equal.
- F. Wiring in lighting fixture channels shall be rated for 90° C minimum.
- G. Do not share neutral conductors. Provide a dedicated neutral conductor for each branch circuit that requires a neutral.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Verify that raceway is complete and properly supported prior to pulling conductors. Use UL listed wire pulling lubricant for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Do not install XHHW-2 conductors when ambient temperatures are below –5 degrees C and THHN/THWN conductors when ambient temperatures are below 0 degrees C.
- D. Conductors shall be carefully inspected for insulation defects and protected from damage as they are installed in the raceway. Where the insulation is defective or damaged, the cable section shall be repaired or replaced at the discretion of the Contracting Officer and at no additional cost to the Contracting Officer.
- E. Place an equal number of conductors for each phase of a circuit in same raceway or cable.
- F. Route conductors from each system in independent raceway system and not intermix in the same raceway, enclosure, junction box, wireway, or gutter as another system unless otherwise shown on the plans.
- G. No more than six current carrying conductors shall be installed in any homerun unless otherwise indicated on the drawings or without prior approval from the Engineer.
- H. Completely and thoroughly swab raceway system before installing conductors.
- I. When two or more neutrals are installed in one conduit, identify each with the proper circuit number in accordance with Section 26 05 53.

3.3 CABLE INSTALLATION

- A. Provide protection for exposed cables where subject to damage.
- B. Support cables above accessible ceilings; do not rest on ceiling tiles. Use spring metal clips or cable ties to support cables from structure. Do not support cables from ceiling suspension system. Include bridle rings or drive rings.
- C. Use suitable cable fittings and connectors.
- D. Trench and backfill for direct buried cables per Division 31. Install warning tape along entire length of direct burial cables.

3.4 WIRING CONNECTIONS AND TERMINATIONS

- A. Stranded wire shall not be wrapped around screw terminals.

- B. Splice only in accessible junction boxes.
- C. Thoroughly clean wires before installing lugs and connectors.
- D. Make splices, taps and terminations to carry full ampacity of conductors without perceptible temperature rise.
- E. Terminate spare conductors with twist on connectors or heat shrink insulation to proper voltage rating.
- F. Control systems wiring in conjunction with mechanical, electrical or miscellaneous equipment to be identified in accordance with wiring diagrams furnished with equipment.
- G. Code sound and signal systems wiring and any special equipment in accordance with manufacturer's diagrams or recommendations.
- H. Do not exceed manufacturer's recommended pull tensions.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01 and Section 26 01 26.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque conductor connections and terminations to manufacturer's recommended values.

3.6 WIRE AND CABLE INSTALLATION SCHEDULE

- A. Building wire and/or remote control and signal cable in raceways unless otherwise noted.
- B. Branch circuit wiring in concealed, dry locations may be non-metallic sheathed cable. In dry, exposed areas areas not subject to damage such as mechanical rooms, Metal Clad cable may be used.
- C. At the Contractor's option, portions of the fire alarm wiring in dry, concealed locations may be installed in Fire Alarm Metal Clad cable.

END OF SECTION 26 05 19

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Power System Grounding.
- B. Electronic Safety and Security System Grounding.
- C. Electrical Equipment and Raceway Grounding and Bonding.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical, Division 27 and Division 28.
- B. Section 26 01 26 – Maintenance Testing of Electrical Systems.
- C. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- D. Section 41 36 19 – Joining Equipment: Welding, Structural.

1.3 REFERENCE STANDARDS

- A. ANSI/NEMA GR-1, Ground Rod Electrodes and Ground Rod Electrode Couplings.
- B. ANSI/NFPA 70 – National Electrical Code.
- C. ASTM B 3 – Standard Specification for Soft or Annealed Copper Wire.
- D. AWS A5.8/A5.8M – Specification for Filler Metals for Brazing and Braze Welding.
- E. IEEE Std 81 – Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System.
- F. IEEE Std 142 – Recommended Practice for Grounding of Industrial and Commercial Power System.
- G. UL 467 – Standard for Grounding and Bonding Equipment.

1.4 SYSTEM DESCRIPTION

- A. Provide a complete grounding system for services and equipment as required by State and Local Codes, NEC, applicable portions of other NFPA codes, and as indicated herein.

1.5 SUBMITTALS

- A. Product Data: Submit product data for all components provided, showing material type and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.
- B. Shop Drawings: Submit shop drawings indicating location of main grounding bus, system grounding electrode connections (ground rods, concrete encased electrode, etc.), routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc.)

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Drawings
 - 1. Accurately indicate actual locations of main grounding bus, all grounding rods, concrete encased electrodes, etc.
 - 2. Show the actual installed routing of grounding electrode conductor, and size/type of bonding conductors and termination locations of all major bonding connections (water, piping, steel, fuel tanks, etc.).
- B. Test Reports
 - 1. See Section 26 01 26 - Maintenance Testing of Electrical Systems for Grounding System Tests.
 - 2. The results of the 3-point fall of potential ground resistance test, performed on the installed grounding system shall be submitted in accordance with the paragraph entitled "Field Quality Control" of this section.
 - 3. Each test report shall include:
 - a. Date of test, soil moisture content, and soil temperature.
 - b. Test operator.
 - c. Instrument or other test equipment used.
 - d. Electrode designation or location matching that shown on shop drawings.
 - e. Ground impedance in ohms.
 - f. Assumptions made - if required.

1.7 COORDINATIONS

- A. Division 01 – Administrative Requirements: Requirements for Coordination.
- B. Complete grounding and bonding of building reinforcing steel prior to concrete placement.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Solid Ground Rods: ANSI/NEMA GR-1, copper-encased steel, ¾ inch diameter, minimum length 10 feet. Ground rods shall be clean and smooth.
- B. Bonding Conductors: Solid bare copper wire for sizes No. 8 AWG and smaller diameter. Stranded bare copper wire for sizes No. 6 AWG and larger diameter. Conductors may be insulated conductors if used provide green insulation.
- C. Grounding Conductors: Copper conductor bare or green insulated.
- D. Mechanical Grounding and Bonding Connectors: Non-reversible crimp type lugs only. Use factory made compression lug for all terminations.
- E. Exothermic Grounding and Bonding Connectors: AWS A5.8/A5.8M Exothermic welded type. Welding procedure shall include the proper mold and powder charge and shall conform to the manufacturer's recommendations.
- F. In external locations, clamping shall be used only where a disconnect type of connection is required. Connection device may utilize threaded fasteners. Device shall be constructed such that positive contact pressure shall be maintained at all times. Machine bolts with spring-type lock washers shall be used.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Provide a separate, insulated equipment-grounding conductor in all feeder and branch circuits. Terminate each end on a grounding lug, bus, or bushing. Multiple conductors on single lug not permitted. Each grounding conductor shall terminate on its own terminal lug.
- B. Connect grounding electrode conductors to metal water pipe using a suitable ground clamp. Make connections to flanged piping at street side of flange. Provide bonding jumper around water meter and back flow preventors.
- C. Supplementary Grounding Electrode: Use driven ground rod on exterior of building. Install ground rod in suitable recessed well; fill with gravel after connection is made.
- D. Provide grounding and bonding at Utility Company's metering equipment.
- E. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing and fuel systems.

- F. Grounding conductors for branch circuits shall be sized in accordance with NEC, except minimum size grounding conductor shall be No. 12 AWG.
- G. Grounding conductor is in addition to neutral conductor and in no case shall neutral conductor serve as grounding means.
- H. Ground rods shall be installed so that the top of the rod is not less than 12 inches below finished grade. Conceal after inspection.

3.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Upon completion of the ground installation and before connection to the permanent facility power the Contractor shall measure the ground resistance of the grounding electrode system. The testing shall utilize an earth resistance meter and be conducted in accordance with the IEEE Standard for 3-point fall of potential method. The Contractor shall notify the Contracting Officer a minimum of 5 business days prior to the scheduled ground testing date so they may be present at the time of testing. The Contractor shall immediately notify the Contracting Officer if the measured ground resistance is above 20 ohms. The Contractor shall submit a copy of the test report to the Contracting Officer within 10 days after testing and before the ground system becomes inaccessible.
- C. Continuity Test: Continuity test shall be performed on all power receptacles to ensure that the ground terminals are properly grounded to the facility ground system.

END OF SECTION 26 05 26

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDED

- A. Section included hangars and supports for Power Systems and Electronic Safety and Security Systems.
- B. Conduit Supports.
- C. Formed Steel Channel.
- D. Spring Steel Clips.
- E. Sleeves.
- F. Mechanical Sleeve Seals.
- G. Equipment Bases and Supports.

1.2 RELATED WORK

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical, and Division 27.
- B. Section 26 05 48 - Vibration and Seismic Controls for Electrical Systems.

1.3 REFERENCES

- A. International Building Code (IBC), Chapter 16 – Structural Design.

1.4 SUBMITTALS

- A. Division 01: Requirements for submittals.
- B. Product Data: Submit product data for specialty supports.

1.5 QUALITY ASSURANCE

- A. Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Manufacturers:
 - 1. Allied Tube & Conduit Corp.
 - 2. Minerallac Fastening Systems.
 - 3. O-Z Gedney Co.
 - 4. Substitutions: per Division 01
- B. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- C. Beam Clamps: Malleable Iron, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- D. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- E. Conduit clamps - general purpose: One-hole malleable iron for surface mounted conduits.

2.2 FORMED STEEL CHANNEL

- A. Manufacturers:
 - 1. B-Line Systems.
 - 2. Allied Tube & Conduit Corp.
 - 3. Unistrut Corp.
 - 4. Substitutions: per Division 01.
- B. Product Description: Galvanized 12 gage) thick steel. With holes 1-1/2 inches on center.

2.3 SLEEVES

- A. Sleeves Through Non-fire Rated Floors: 18 gage thick galvanized steel.
- B. Sleeves Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage thick galvanized steel.
- C. Sleeves Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

- D. Fire-stopping Insulation: Glass fiber type, non-combustible.

2.4 MECHANICAL SLEEVE SEALS

- A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.

3.2 PREPARATION

- A. Obtain permission from Contracting Officer before using powder-actuated anchors.
- B. Obtain permission from Contracting Officer before drilling or cutting structural members.

3.3 INSTALLATION - GENERAL

- A. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using precast insert system, expansion anchors, preset inserts, beam clamps, or spring steel clips.
- B. Use toggle bolts or hollow wall fasteners in and walls; self-drilling anchors or expansion anchor on concrete surfaces; sheet metal screws in sheet metal studs; and wood screws in wood construction.
- C. Do not support raceways, low voltage pathways, cables, or boxes from ceiling suspension wires or suspended ceiling systems. Provide support from building structure independently to allow ceiling removal and replacement without removal of electrical system. If dedicated support wires are used, wires and wire clips must be painted or color-coded. Exception: Outlet boxes for ceiling-mounted light fixtures, speakers, and smoke detectors may be mounted in the ceiling system.
- D. Do not fasten supports to piping, ductwork, mechanical equipment, conduit, or ceiling suspension system.
- E. Do not penetrate by drilling or screwing into metal roof decking. All penetrations into metal roof decking must be approved by the Project Manager in writing.

- F. Fabricate supports from structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.
- G. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- H. Securely fasten fixtures and equipment to building structure in accordance with manufacturer's recommendations and to provide necessary earthquake anchorage.
- I. Provide wall attached fixtures and equipment weighing less than 50 pounds with backing plates of at least 1/8" x 10" sheet steel or 2" x 10" fire retardant treated wood securely built into the structural walls. Submit attachment details of heavier equipment for approval.
- J. Earthquake Anchorages:
 - 1. Equipment weighing more than 50 pounds shall be adequately anchored to the building structure to resist lateral earthquake forces.
 - 2. Total lateral (earthquake) forces shall be 1.5 times the equipment weight acting laterally in any direction through the equipment center of gravity. Provide adequate backing at structural attachment points to accept the forces involved.
- K. Provide one seismic support wire for all fixtures weighing less than 10lbs. two minimum color-coded dedicated seismic support wires for each ceiling mounted light fixture weighing less than 50 pounds. Attach support wires to building structure independent from ceiling system and on opposing corners of the light fixtures to not allow fixture to drop more than 6 inches upon ceiling failure. Secure each end with three tight wraps within 1 inch at each end of the wire. Provide four supports on fixtures >50 lbs.
- L. Attach the supporting cables for all pendant fixtures to both the building structure and to the ceiling grid which they pass through.
- M. Power-driven fasteners are prohibited for tension load applications (such as supporting luminaires or conduit racks from ceiling above). Use drilled-in expansion anchors, or drilled and screw-in anchors such as Kwik-Con II or Tapcon.

3.4 INSTALLATION - SLEEVES

- A. Exterior watertight entries: Seal with adjustable interlocking rubber links.
- B. Conduit penetrations not required to be watertight: Sleeve and fill with silicon foam.
- C. Set sleeves in position in forms. Provide reinforcing around sleeves.
- D. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- E. Extend sleeves through floors 1 inch above finished floor level. Caulk sleeves.

- F. Where conduit or raceway penetrates floor, ceiling, or wall, close off space between conduit or raceway and adjacent work with fire stopping insulation and caulk. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- G. Install stainless steel escutcheons at finished surfaces.

END OF SECTION 26 05 29

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Metal Conduit.
- B. Flexible Metal Conduit.
- C. Liquidtight Metal Conduit.
- D. Electrical Metallic Tubing.
- E. Surface Mounted Raceway.
- F. Auxiliary Gutter.
- G. Fittings and Conduit Bodies.
- H. Wall and Ceiling Outlet Boxes.
- I. Pull and Junction Boxes.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions.
- B. Division 01 - General Requirements, Summary, Administrative Requirements.
- C. Division 07 - Thermal and Moisture Protection.
- D. Division 08 - Openings: Access Doors and Frames.
- E. Section 26 05 00 – Common Work Results for Electrical.
- F. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- G. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- H. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- I. Section 26 05 53 – Identification for Electrical Systems.

- J. Section 26 27 16 – Electrical Cabinets and Enclosures.
- K. Section 26 27 26 – Wiring Devices.
- L. Section 27 05 29 - Hangers and Supports for Communications Systems.
- M. Section 27 10 00 – Structured Cabling.
- N. Section 28 05 28.29 - Hangers and Supports for Electronic Safety and Security.

1.3 REFERENCES

- A. American National Standards Institute (ANSI):
 - 1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
 - 2. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM A 123 – Specification for Zinc Coatings on Products Fabricated from Rolled, Pressed, and Forged Steel Shapes, Plates, Bars and Strip.
- C. National Electrical Manufacturers Association (NEMA):
 - 1. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
 - 2. NEMA OS 1 - Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
 - 3. NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
 - 4. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
 - 5. NEMA TC 2 - Electrical Plastic Tubing (EPT) and Conduit (EPC-40 and EPC-80).
 - 6. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.
 - 7. NEMA TC 7 - Smooth-Wall Coilable Polyethylene Electrical Plastic Conduit.
 - 8. UL651B – Continuous Length HDPE Conduit.
 - 9. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- D. National Fire Protection Association (NFPA):
 - 1. NFPA 70 - National Electrical Code.
- E. Telecommunications Industry Association (TIA) and Electronics Industries Association (EIA):
 - 1. ANSI/TIA/EIA 568-B Commercial Building Telecommunications Cabling Standard.
- F. Building Industry Consulting Service International (BICSI):
 - 1. BICSI Telecommunication Design Methods Manual.
- G. International Building Code (IBC):

1. IBC chapters 16 and 17 seismic requirements.

1.4 RACEWAY AND BOX INSTALLATION SCHEDULE

A. Raceway Minimum Size:

1. Above Grade or Slab on Grade: Provide 1/2 inch minimum, unless otherwise noted. Raceway may be reduced to 1/2 inch for final connection of raceway up to 6 feet for connection to fixture or device where maximum conduit entry size is 1/2 inch.

B. Outdoor Above Grade, Damp or Wet Interior Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide weatherproof malleable iron for branch circuit junction and outlet boxes. Provide weatherproof NEMA 3R sheet metal enclosures for safety and disconnect switches and NEMA 4 sheet metal enclosures with gaskets for motor controllers and control panels.
3. Fittings: Provide galvanized malleable iron with gaskets. Provide Myers threaded hubs for all conduit entries into top and side of sheet metal enclosures.

C. Concealed Dry Locations:

1. Raceway: Provide electrical metallic tubing. See section 26 05 19 cable installation and wire and cable installation schedule.
2. Boxes and Enclosures: Provide sheet-metal boxes where Conduit or Metal Clad cabling is used. Non-metallic boxes may be used where non-metallic sheathed cable is installed. Fittings: Provide galvanized malleable iron and steel.

D. Exposed Dry Locations:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit. EMT conduit may be used where exposed conduit is allowed and where not subject to physical damage. See section 26 05 19 cable installation and wire and cable installation schedule.
2. Boxes and Enclosures: Provide sheet-metal boxes with raised steel covers.
3. Fittings: Provide galvanized malleable iron and steel.
4. Surface Raceway and Boxes. Where specifically noted on the Drawings, provide surface raceway and boxes.

E. Branch Circuits 60 Amperes or Larger and Feeders:

1. Raceway: Provide rigid steel conduit or intermediate metal conduit.
2. Boxes and Enclosures: Provide sheet-metal boxes.
3. Fittings: Provide galvanized malleable iron and steel.

1.5 DESIGN REQUIREMENTS

A. Raceway Minimum Size:

1. Line Voltage Circuits: Raceway is sized on the drawings for copper conductors with 600-Volt type XHHW insulation, unless otherwise noted. Where a raceway size is not shown on the drawings, it shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9 using the conduit dimensions of the NEC Table 4, Chapter 9 and conductor properties of the NEC Table 5, Chapter 9.
 2. Fire Alarm, and other Low-Voltage Circuits: Where installed in raceways, the raceway size shall be calculated to not exceed the percentage fill specified in the NEC Table 1, Chapter 9, using the conduit dimensions of the NEC Table 4, Chapter 9, and cable diameter provided by the manufacturer.
- B. Box Minimum Size: Provide all boxes sized and configured per NEC Article 370 and as specified in this section.
- C. Seismic Support: Provide support in accordance with section 26 05 29.

1.6 SUBMITTALS

- A. Section 01 33 00 - Submittals and Section 26 05 00 - Electrical General Provisions.
- B. Product Data: Submit data for products to be provided.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- B. Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

2.1 RIGID METAL CONDUIT (RMC)

- A. Rigid Steel Conduit: ANSI C80.1, UL 6.
- B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; Galvanized malleable iron with threaded hubs for all conduit entries. Provide threaded connections and couplings only. Set Screw and running thread fittings are not permitted.
- C. Provide insulated throat bushings at all conduit terminations.

2.2 INTERMEDIATE METAL CONDUIT (IMC)

- A. Product Description: ANSI C80.6, UL 1242; Galvanized Steel Conduit.

- B. Fittings and Conduit Bodies: NEMA FB 1, UL 514B; use fittings and conduit bodies specified above for rigid steel conduit.
- C. Provide insulated throat bushings at all conduit terminations.

2.3 FLEXIBLE METAL CONDUIT (FMC)

- A. Product Description: UL 1, FS WW-C-566; galvanized or zinc-coated flexible steel, full or reduced-wall thickness.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron with insulated throat bushings. Die cast zinc or threaded inside throat fittings are not acceptable.

2.4 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Product Description: UL 360, flexible metal conduit with interlocked steel construction and PVC jacket.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; liquid tight steel or malleable iron with insulated throat bushings. Die cast fittings are not acceptable.

2.5 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3, UL 797; galvanized steel tubing.
- B. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel or malleable iron, compression or set screw type with insulated throat bushings. Zinc die cast, or indentor fittings are not acceptable.
- C. Maximum size shall be 2". Provide factory elbows on sizes 1-1/2" and larger.

2.6 RIGID NONMETALLIC CONDUIT (RNC)

- A. Not approved for use on this project.

2.7 SURFACE RACEWAY

- A. Dual-Channel:
 - 1. Manufacturers:
 - a. Wiremold, V4000 series.
 - b. Mono Systems, SnapMark SMS4200-I series.
 - c. Hubbell, HBL4750 series.
 - d. Substitutions: Section 01300 - Submittals.

2. Product Description: Dual-channel surface steel raceway with fitted snap on cover and steel accessories, suitable for use as multi-outlet assembly. Keep data and power conductors separate at all times. Provide radius fittings and components. Inserts or limiting cable fill is not acceptable. Raceway covers with knockouts for accessories or cable entries are not acceptable.
3. Size: 4-3/4 inches wide x 1-3/4 inches deep. Two equal compartments.
4. Receptacles: Provide accessories to accept receptacles as specified in Section 26 27 26.
5. Telecommunication Outlets: As specified in Section 27 10 00.
6. Device Spacing: As indicated on drawings.
7. Channel Finish: Ivory.
8. Fittings: Furnish manufacturer's standard couplings, entrance fittings, elbows, device brackets, end caps, seam covers, wire clips, device faceplates and connectors.
 - a. Divided Entrance End Fitting: Wiremold #V4010DFO, SnapMark SMS4205-3-I, Hubbell #HBL4710DFOIV for power and telecom.
 - b. Internal Elbows: Wiremold #V4017FO, SnapMark #SMS4214FO-I, Hubbell #4717DFOIV.
 - c. External Elbows: Wiremold #V4018FO, SnapMark #SMS4218FO-I, Hubbell #4718DFOIV.
 - d. Flat Elbow: Wiremold #V4011FO, SnapMark #SMS4209FO-I, Hubbell #4711DFOIV.
 - e. Divided TEE: Wiremold #V4015DFO, SnapMark #SMS4211FO-I, Hubbell #4715DFOIV.
 - f. Blank End: Wiremold #4010B, SnapMark #SMS4204-I, Hubbell #4710BIV.
 - g. Device Back Plate: Wiremold #V4007C-1R special order without adjacent channel knock-out or #V4007C-1 where device will accommodate device width, SnapMark #SMS4231-I, Hubbell #HBL4717BXIV.
 - h. Divider: Wiremold #G4000D and #G4001D, SnapMark #SMS4201 and #SMS4207, Hubbell #HBL4750 DGY.
 - i. Wire Clip: Wiremold #G4000WC, SnapMark #SMS4206, Hubbell #HBL4750WCGY.
 - j. Couplings: Wiremold G4001, SnapMark #SMS4202, Hubbell #HBL4751AC.
9. Cuts: Perform all cuts with raceway base and cover shear specifically designed for installed raceway system. Wiremold #640B and #640C, SnapMark #642-B and #642-C, Hubbell #HBL640B and #HBL640C.

B. Single Channel – Fire Alarm and Security System:

1. Manufacturers:
 - a. Wiremold, V700 series.
 - b. Mono Systems, SnapMark SMS700 series.
 - c. Hubbell, HBL750 series.
 - d. Substitutions: Under the provisions of Division 01.
2. Description: Single-channel surface metallic raceway with fitted cover.
3. Size: 3/4 inch wide x 1/2 inch deep single compartment.

4. Device Locations: As indicated on the drawings.
5. Channel Finish: Ivory.
6. Fittings: Furnish manufacturer's standard couplings, entrance fittings, elbows, device brackets, end caps, seam covers, wire clips, device faceplates and connectors.
 - a. Conduit Connector: Wiremold #V5782, SnapMark #SMS5782, Hubbell #HBL5784IV.
 - b. Box Connector: Wiremold #V5781, SnapMark #SMS5781, Hubbell #HBL5781A.
 - c. Internal Elbow: Wiremold #V717, SnapMark #SMS717, Hubbell #HBL717IV.
 - d. External Elbow: Wiremold #V718, SnapMark #SMS718, Hubbell #HBL718IV.
 - e. 90 Flat Elbow: Wiremold #V711, SnapMark #SMS711, Hubbell #HBL711IV.
 - f. TEE: Wiremold #V5715, SnapMark #SMS5715, Hubbell #HBL5715.
 - g. Bushing: Wiremold #V702, SnapMark #SMS702, Hubbell #HBL702B.
 - h. Coupling: Wiremold #V5701, SnapMark #SMS5701, Hubbell #HBL5701C.
 - i. Supporting Clip: Wiremold #V5703, SnapMark #SMS5703, Hubbell #HBL5703IV.
 - j. Connection Cover (Where covers not squarely cut): Wiremold #V706, SnapMark #SMS706, Hubbell #HBL706IV.
 - k. Mounting Strap: Wiremold #V704, SnapMark #SMS704, #HBL704IV.
 - l. Shallow Box: Wiremold #V5747, SnapMark #SMS5747, #HBL5747IV.
 - m. Extra Shallow Box: Wiremold #V5748S, SnapMark SMS5748S, #HBL5748SIV.
7. Cuts: Perform all cuts with raceway base and cover shear specifically designed for installed raceway system. Wiremold #607, SnapMark #607, Hubbell #HBL607CUT.

2.8 AUXILIARY GUTTERS

- A. Manufacturers:
 1. Square D.
 2. Circle AW.
 3. Hoffmann.
 4. Substitutions under provision of Division 01.
- B. Auxiliary Gutters: General purpose Raintight type wireway, with knockouts.
- C. Size and length as indicated on Drawings.
- D. Cover: Hinged cover with full gasketing.
- E. Connector: Slip-in construction; hinged cover.
- F. Fittings: Lay-in type with removable top, captive screws.
- G. Finish: Rust inhibiting primer coat with gray enamel finish.

2.9 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, UL514A galvanized steel, with plaster ring where applicable.
 - 1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
 - 2. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required. Minimum Size: 4 inches square or octagonal, 2-1/8 inches deep.
 - 3. Cut-In Boxes: Minimum size 2" x 3" x 2-1/2" deep. Provide cut-in outlet boxes where required for installation in existing walls.
- B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2, thermoset, phenolic with 150°C fire rating. Provide plaster ring where applicable.
 - 1. Wall Outlets: Minimum size 3-1/2" x 2-1/4" x 2-7/8" deep.
 - 2. Ceiling Outlets: Minimum size 4" diameter 2-9/16" deep.
- C. Cast Boxes: NEMA FB 1, Type FD, galvanized malleable iron. Furnish gasketed cover by box manufacturer. Furnish threaded hubs. "Bell" boxes are not acceptable.
- D. Wall Plates: As specified in Section 26 27 26.

2.10 PULL AND JUNCTION BOXES

- A. Sheet Metal Pull and Junction Boxes: ANSI/NEMA OS 1, UL514A galvanized steel.
 - 1. Minimum Size: 4 inches square or octagonal, 1-1/2 inches deep, unless otherwise noted.
- B. Nonmetallic Pull and Junction Boxes: ANSI/NEMA OS 2, thermoset, phenolic with 150°C fire rating.
 - 1. Minimum Size: 6 inches square, 4 inches deep, unless otherwise noted.
- C. Sheet Metal Boxes Larger Than 12 Inches in Any Dimension: Hinged enclosure in accordance with Section 26 27 16. Hoffman or approved equal.
- D. Cast Metal Boxes for Outdoor and Wet Location Installations: NEMA 250, Type 4; flat-flanged, surface mounted junction box, UL listed as raintight:
 - 1. Material: Galvanized cast iron.
 - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover and screws.

2.11 FLOOR BOXES

- A. Floor Boxes for Installation in Wood Floors: Full adjustable, steel boxes.

- B. Concealed Service Floor Boxes: Multi-service steel floor box suitable for use in wood floors and meeting the UL scrub water exclusion requirements. Provide large multi-gang floorbox for power, data and A/V with dividers as required to install the devices shown on the Plans. Provide brushed aluminum carpet/tile flange and coverplates as required to accommodate all installed devices. Provide flush service covers in tile floors and flanged cover in carpet floors. Wiremold #Evolution series, Hubbell System One or approved equal.

2.12 EXPANSION FITTINGS

- A. Galvanized malleable iron, galvanized with grounding bond jumper.

2.13 BUSHINGS

- A. Non-grounding: Threaded impact resistant plastic.
- B. Grounding: Insulated galvanized malleable iron/steel with hardened screw bond to raceway and conductor lug.

2.14 LOCKNUTS

- A. Threaded Electro Zinc Plated Steel designed to cut through protective coatings for ground continuity.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Ground and bond raceway and boxes in accordance with Section 26 05 26.
- B. Provide seismic support and fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify raceway and boxes with origin and destination in accordance with Section 26 05 53.
- D. Unless otherwise noted, do not inter-mix conductors from separate panelboards or any other system in the same raceway system or junction boxes.

3.2 INSTALLATION - GENERAL RACEWAY

- A. Install raceway for all systems, unless otherwise noted.
- B. Install an equipment grounding conductor inside of all raceways containing line voltage conductors.

- C. Provide raceways concealed in construction unless specifically noted otherwise, or where installed at surface cabinets, motor and equipment connections and in Mechanical and Electrical Equipment rooms. Do not route conduits on roofs, outside of exterior walls, or along the surface of interior finished walls unless specifically noted on the plans.
- D. Raceway routing and boxes are shown in approximate locations unless dimensioned. Where raceway routing is not denoted, field-coordinate to provide complete wiring system.
- E. Do not route raceways on floor. Arrange raceway and boxes to maintain a minimum of 6 feet 6 inches of headroom and present a neat appearance. Install raceways level and square to a tolerance of 1/8" per 10 feet. Route exposed raceways and raceways above accessible ceilings parallel and perpendicular to walls, ceiling, and adjacent piping.
- F. Maintain minimum 6-inch clearance between raceway and mechanical and piping and ductwork. Maintain 12-inch clearance between raceway and heat sources such as flues, steam pipes, heating pipes, heating appliances, and other surfaces with temperatures exceeding 104 degrees F.
- G. Do not install raceway imbedded in spray applied fire proofing. Seal raceway penetrations of fire-rated walls, ceilings, floors in accordance with the requirements of Section 26 05 00 and Division 07.
- H. Where raceway penetrates fire-rated walls and floors seal opening around conduit with UL listed firestop sealant or intumescent firestop, preserving the fire time rating of the construction. Install in accordance with Section 07 84 00 Firestopping.
- I. Conduit embedded in concrete or solid masonry shall not be larger than 1/3 the thickness of the wall and shall be spaced not less than three diameters apart. No cutting of reinforcing bars shall be permitted unless specifically approved. Should structural members prevent the installation of conduit or equipment, notify the Contracting Officer before proceeding.
- J. Arrange raceway supports to prevent misalignment during wiring installation. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- K. Do not attach raceway to ceiling support wires or other piping systems and do not fasten raceway with wire or perforated pipe straps. Remove all wire used for temporary raceway support during construction, before conductors are pulled. Raceway shall be installed to permit ready removal of equipment, piping, ductwork, or ceiling tiles.
- L. Group raceway in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps, as specified in Section 26 05 29. Provide space on each rack for 25 percent additional raceway.
- M. Cut conduit square; de-burr cut ends. Bring conduit to the shoulder of fittings and couplings and fasten securely. Where locknuts are used, install with one inside box and one outside with dished part against box.

- N. Use threaded raintight conduit hubs for fastening conduit to cast boxes, and for fastening conduit to sheet metal boxes in damp or wet locations. Sealing locknuts are not acceptable.
- O. Install no more than the equivalent of three 90-degree bends between boxes.
- P. Install conduit bodies to make sharp changes in direction, such as around beams. "Goosenecks" in conduits are not acceptable.
- Q. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2 inch size.
- R. Provide protective plastic bushings or insulated throat bushings at each raceway termination not installed to an enclosure. Bushings shall be threaded to the raceway end or connector.
- S. Avoid moisture traps; install junction box with drain fitting at low points in raceway system.
- T. Install fittings and flexible metal conduit to accommodate 3-axis movements where raceway crosses seismic joints.
- U. Install fittings designed and listed to accommodate expansion and contraction where raceway crosses control and expansion joints.
- V. Use cable sealing fittings forming a watertight non-slip connection to pass cords and cables into conduit. Size cable sealing fitting for the conductor outside diameter. Use Appleton CG series or equal cable sealing fittings.
- W. Use suitable caps to protect installed raceway against entrance of dirt and moisture.
- X. Provide nylon "jet-line" or approved equal pull string in empty raceway, except sleeves and nipples.
- Y. Paint all exposed conduit to match surface to which it is attached or crosses. Clean greasy or dirty conduit prior to painting in accordance with paint manufacturer's instructions. Where raceway penetrates non-rated ceilings, floors or walls, provide patching, paint and trim to retain architectural aesthetics similar to surroundings.

3.3 INSTALLATION – GENERAL BOXES

- A. Provide electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and code compliance. All electrical box locations shown on Drawings are approximate unless dimensioned.
- B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only. Where installation is inaccessible, install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaries. Coordinate locations and sizes of required access doors with Division 08.

- C. Coordinate layout and installation of boxes to provide adequate headroom and working clearance. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- D. Align wall-mounted outlet boxes for switches, thermostats, and similar devices.
- E. Use multiple-gang boxes where more than one device are mounted together; do not use sectional boxes. Provide barriers to separate wiring of different voltage systems and where normal and emergency power circuits occur in the same box.
- F. Verify location of floor boxes in offices and work areas prior to rough-in. Set boxes level and flush with finish flooring material.
- G. Adjust box location up to 6 feet prior to rough-in to accommodate intended purpose.
- H. Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- I. Unless otherwise specifically noted, locate outlet boxes for light switches within 6 inches of the door jamb on the latch side of the door.
- J. Position outlets to locate luminaires as shown on reflected ceiling plans.
- K. Locate and install boxes to maintain headroom and to present a neat appearance.
- L. Locate flush-mounted box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- M. Provide knockout closures for unused openings.
- N. Install boxes in walls without damaging wall insulation or reducing its effectiveness.
- O. Provide recessed outlet boxes in finished areas; secure boxes to interior wall and partition studs, accurately positioning to allow for surface finish thickness. For outlet boxes in walls with combustible finished surfaces such as wood paneling or fabric wall coverings, position box to be flush with finished surface per NEC requirements.
- P. Use stamped steel stud bridges for flush outlets in hollow stud wall, and adjustable steel channel fasteners for flush ceiling outlet boxes. Accurately position bridges to allow for surface finish thickness.
- Q. Do not install flush mounted boxes back-to-back in walls; install with minimum 6 inches separation.
- R. Install with minimum 24 inches separation in fire rated walls. Limit penetrations in fire rated walls to 16 square inches each and a maximum total combined penetration area of 100 square inches in any given 100 square feet of wall. Where penetrations are in excess of these requirements provided UL listed fire stop wrap acceptable to Authority having Jurisdiction.
- S. Do not fasten boxes to ceiling support wires or other piping systems.

- T. Support boxes independently of conduit.
- U. Clean interior of boxes to remove dust, debris, and other material and clean exposed surfaces and restore finish.
- V. Provide blank covers or plates for all boxes that do not contain devices.

3.4 INSTALLATION – SURFACE RACEWAY

- A. Install flat-head screws, clips, and straps to fasten raceway channel to surfaces; mount plumb and level. Install insulating bushings and inserts at connections to outlets and corner fittings. Provide divider to keep power and data pathways separate at all times. Bond each section together to provide electrically continuous system.
- B. Close ends and unused openings in wireway and surface raceway.

3.5 INSTALLATION – AUXILIARY GUTTER

- A. Bolt auxiliary gutter to steel channels fastened to the wall or ceiling or in self-supporting structure. Install level.
- B. Gasket each joint in oil-tight gutter.
- C. Mount raintight gutter in horizontal position only.

3.6 INSTALLATION – BURIED CONDUITS

- A. Excavation and backfilling shall be in accordance with these specifications and the applicable portions of Division 31:
 - 1. Excavate and backfill as necessary for proper installation or work.
 - 2. Provide bracing and shoring as necessary or required.
 - 3. Compact backfill under footings, floor slabs and paving using materials and methods specified under Division 31, Earthwork.
 - 4. All conduits outside the building perimeter shall be buried a minimum of 24 inches below grade. Bottom of trench shall be smoothed and all rocks and cobbles 3 inches and larger shall be removed. Conduits shall be bedded in a minimum of 2 inches of sand and shall have a cover of 2 inches minimum of sand. Trench shall be backfilled with non-frost susceptible material and compacted.
 - 5. Conduits below slab on grade shall be installed in the top 6 inches of classified material.
 - 6. Damage to existing underground utilities shall be repaired immediately by the Contractor at no cost to the Contracting Officer.

END OF SECTION 26 05 33

SECTION 26 05 48

VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, Section 26 05 00 – Common Work Results for Electrical, Division 27 and Division 28.

1.2 DESCRIPTION

- A. Provide seismic anchorage and restraint of electrical systems including, equipment, raceways, cable trays, lighting fixtures, etc.
- B. Seismic Category D, E and F:
 - 1. All electrical items that are of Importance Factor (I_p) = 1.5 are required to be seismically braced. This applies to the following:
 - a. The component is required to function for life safety purposes after an earthquake, including fire protection systems, fire alarm systems, emergency lighting, etc.
 - b. The component contains hazardous materials.
 - c. The component is in or attached to an Occupancy Category IV structure (Hospitals, fire station, police station, emergency shelters, etc. per ASCE 7-05, Table 1-1) and it is needed for continued operation of the facility or its failure could impair the continued operation of the facility.
- C. All other electrical equipment shall be assigned a component importance factor (I_p) = 1.0 and are required to be seismically braced unless one of the following conditions is satisfied:
 - 1. Component is MOUNTED (connection to structure) at less than 4' above the floor (to the center of gravity of the component), and weighs less than 400 lbs.
 - 2. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 50 lbs (if it is concealed).
 - 3. Component is mounted higher than 4' (to the center of gravity of the component), but weighs less than 100 lbs (if it is exposed).
 - 4. Flexible connections between the components and associated conduit are provided.
 - 5. All runs or groupings of conduits on or off of trapezes shall be seismically braced, unless the distribution system (including conduit, wiring and fittings) weighs less than 5 pounds per linear foot.

6. Lighting fixtures, lighted signs and ceiling fans that are not rigidly connected to ducts or piping, that are supported by chains or otherwise suspended from structure, are not required to be seismically braced, as long as:
 - a. The attachment points can carry at least 140% of the weight of the fixture, and
 - b. The swinging light will not create a falling debris problem by bumping into ceiling of other finishes, and
 - c. Connections to structure allow for movement of the fixture without damaging the connections.
- D. In accordance with ASCE 7-05 13.6.4, all electrical components with $I_p = 1.5$ shall also satisfy the following requirements:
 1. Provisions shall be made to eliminate seismic impact between components.
 2. Loads imposed on the components by attached utility or service lines that are attached to separate structures shall be evaluated.
 3. Batteries on racks shall have wrap-around restraints to ensure that the batteries will not fall from the rack. Spacers shall be used between restraints and cells to prevent damage to cases. Racks shall be evaluated for sufficient lateral load capacity.
 4. Internal coils of dry type transformers shall be positively attached to their supporting substructure within the transformer enclosure.
 5. Electrical control panels, computer equipment, and other items with slide-out components shall have a latching mechanism to hold the components in place.
 6. Electrical cabinet design shall comply with the applicable National Electrical Manufacturers Association (NEMA) standards. Cutouts in the lower shear panel that have not been made by the manufacturer and reduce significantly the strength of the cabinet shall be specifically evaluated.
 7. The attachments of additional external items weighing more than 100 lbs shall be specifically evaluated if not provided by the manufacturer.
 8. Where conduit, cable trays, or similar electrical distribution components are attached to structures that could displace relative to one another and for isolated structures where such components cross the isolation interface, the components shall be designed to accommodate the seismic relative displacements defined in ASCE 7-05 Section 13.3.2.
- E. Unless otherwise exempted above, electrical component supports and the means by which they are attached to the component shall be designed for the Seismic Category they are installed in accordance with ASCE 7-05 Section 13.6.5.

1.3 REFERENCE STANDARDS

- A. Seismic anchorage and restraints shall be designed and installed in accordance with codes and standards as enforced by authorities having jurisdiction in Anchorage, Alaska. Authorities shall include Government's insurance company.
- B. Where applicable, building standards supersede those of other evaluation or listing agencies referenced in specification.
- C. International Building Code (IBC), Chapter 16 – Structural Design.

- D. ASCE 7-05 Chapter 13.

1.4 SUBMITTALS

- A. Provide structurally engineered shop drawings for seismic restraint of all electrical equipment required by the International Building Code (IBC), Chapters 16, 17. Structural design shall be based on the Seismic Use Category and Seismic Design Category as designated in these chapters.
- B. Provide complete calculations, drawings and details.
- C. Shop drawings shall be stamped by a professional engineer registered in the State of Alaska.
- D. Submittals shall be coordinated with building Structural engineer.
- E. Submit for approval, seismic restraint calculations, drawings and details to authorities having jurisdiction as required by those authorities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Materials and devices shall be in accordance with applicable codes and standards and shall be appropriate for intended use.
- B. Anchors and attachments to building structure shall be as approved by building Structural engineer.
- C. Seismic restraints used in conjunction with vibration isolators may consist of loose cables, telescoping pipes or box sections, angles or sections, flat plates used as limit stops or snubbers, or other types of housing used either integral with or separate from vibration isolators to accomplish necessary seismic restraint.

2.2 EQUIPMENT

- A. Equipment available with seismic rating shall be provided with rating applicable to seismic zone of project location.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Secure stationary equipment, raceways and equipment supports to structure, concrete bases, or special supports to provide protection against earthquakes and to restrain lateral or vertical

movement. Where vibration isolators are used, seismic restraints shall be designed to limit lateral or vertical movement during earthquake without short-circuiting vibration isolation system.

- B. Coordinate seismic restraints with building Structural engineer and incorporate building Structural engineer's requirements.
- C. Seismic restraint methods and materials shall be supplementary to support devices specified in other sections of this specification and together shall serve as equipment support criteria.
- D. Installation of devices shall be in accordance with seismic Structural engineer's drawings and details and in accordance with seismic guidelines.
- E. Coordinate installation of devices with other trades and incorporate their requirements.
- F. Modify raceway and equipment locations as required for seismic restraint system.
- G. Seismic restraint systems shall not interfere with installation of other building systems or access.

END OF SECTION 26 05 48

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Nameplates and Tape Labels.
- B. Wire and Cable Markers.
- C. Wire Markers.
- D. Conduit Markers.
- E. Working Clearance Striping.
- F. Power One-line Diagram and Panel Map.
- G. Low-voltage One-line Diagrams and System Maps.

1.2 RELATED WORK

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- D. Section 26 24 16 – Panelboards.
- E. Section 26 27 26 – Wiring Devices.
- F. Section 27 10 00 – Structured Cabling.
- G. Section 28 31 00 – Fire Detection and Alarm.

1.3 SUBMITTALS

- A. Division 01 and Section 26 05 00 – Common Work Results for Electrical.
- B. Product Data:

1. Submit manufacturer's catalog literature for each product required.
 2. Submit electrical identification schedule including list of wording, symbols, letter size, color-coding, tag number, location, and function.
- C. Manufacturer's Installation Instructions: Indicate installation instructions, special procedures, and installation.
- D. Prior to installation, submit power one-line diagram and panel map for review.
- E. Prior to Substantial Completion, submit copies of all panel schedules for review by the Government. The Contracting Officer will note any changes to the room numbers/names and the Contractor shall provide revised typed panel schedules to reflect all changes, at no additional cost to the Government.
- F. Electrical One-Line Diagrams and Panel Maps: Provide electronically in AutoCAD format, submitted with the O&M manuals.

1.4 ENVIRONMENTAL REQUIREMENTS

- A. Install labels and nameplates only when ambient temperature and humidity conditions for adhesive are within range recommended by manufacturer.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Product Description: Laminated three-layer plastic with engraved white letters on black background. Nameplate for service disconnect shall be engraved white letters on red background.
- B. Letter Size:
1. 1/4-inch high letters for identifying individual panel or equipment.
 2. 1/8-inch high letters for remaining lines with 1/8 inch spacing between lines.
- C. Minimum nameplate size: 1/8 inch thick with a consistent length and height for each type of nameplate wherever installed on the project.

2.2 TAPE LABELS

- A. Product Description: Adhesive tape labels, with 3/16 inch Bold Black letters on clear background made using Dymo RhinoPro 5000 label printer or approved equal.
- B. Embossed adhesive tape will not be permitted for any application.

2.3 WIRE MARKERS

- A. Power and Lighting Description: Machine printed heat-shrink tubing, cloth or wrap-on type, for all neutrals and Phase conductors.
- B. Low Voltage System Description: Self-adhesive machine printed label with unique wire number that is shown on shop drawing for system.

2.4 FIRE ALARM CONDUIT AND BOX IDENTIFICATION

- A. Product Description: Red spray paint for fire alarm boxes.
- B. Fire alarm conduit shall have red finish, as specified in Section 26 05 33.

2.5 WORKING CLEARANCE STRIPING

- A. Product description: 2" wide epoxy yellow paint with 2 inch high block letters within the clearance area to read: "ELECTRICAL CLEARANCE – NO STORAGE WITHIN THIS ZONE".

2.6 POWER DISTRIBUTION SYSTEM ONE-LINE DIAGRAM AND PANEL MAP

- A. Product Description: One-line diagram and building floor plan panel map. One-line diagram shall show the complete building power system for each MDP. Panel map shall show the plan view location of all distribution panels and branch panelboards. Minimum size shall be 11"x17" but larger maps are recommended. All text shall be legible without magnification.
- B. Install one-line and panel map behind a Plexiglas cover screwed to wall on four corners, adjacent to each MDP.

2.7 LOW-VOLTAGE SYSTEMS ONE-LINE DIAGRAMS AND MAPS

- A. Provide one-line diagrams and system maps for low-voltage and special systems, such as fire, security, etc. Requirements are specified in individual specification sections for each system.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION

- A. Degrease and clean surfaces to receive nameplates and tape labels.
- B. Install nameplates and tape labels parallel to equipment lines.

3.2 NAMEPLATE INSTALLATION

- A. Secure nameplates to equipment fronts using machine screws tapped and threaded into panelboard, or using rivets. The use of adhesives is not acceptable. Machine screws to not protrude more than 1/16 inch on back side.
- B. Service Disconnect Nameplate: Provide nameplate on exterior service disconnect that reads “SERVICE DISCONNECT”.
- C. Distribution Panel Nameplates:
 - 1. Provide overall equipment identification.
 - a. Line 1: Distribution panel name.
 - b. Line 2: Source which panelboard is fed.
 - c. Line 3: Voltage, phase and wire configuration.
 - d. Line 4: AIC rating of the panel.
 - e. Line 5: Where applicable, indicate that panel is series-rated.
 - 2. Provide circuit breaker identification for each feeder breaker.
 - a. Line 1: Name of panelboard or equipment served.
 - b. Line 2: Location of served panelboard.
- D. Branch Panelboard Nameplates:
 - 1. Provide nameplate for each panelboard with the following information:
 - a. Line 1: Panelboard name.
 - b. Line 2: Source from which the panelboard is fed.
 - c. Line 3: Voltage, phase and wire configuration.
 - d. Line 4: AIC rating of the panelboard.
- E. Disconnects, Starters, or Contactors:
 - 1. Provide nameplate for each device with the following information:
 - a. Line 1: Load served.
 - b. Line 2: Panelboard and circuit number from which the device is fed.
 - c. Line 3: Fuse or Circuit amperage and poles. Where fused disconnect is installed, denote the maximum fuse size to be installed.
- F. Control or Low Voltage System Panels:
 - 1. Provide nameplate for each control panel with the following information:
 - a. Line 1: Unique panel name as shown on the shop drawings.
 - b. Line 2: System description such as Fire Alarm, Intercom, BAS, Security, etc.
 - c. Line 3: Panelboard and circuit number from which the panel is fed if applicable.

3.3 LABEL INSTALLATION

- A. Conduit Feeder Labels - Provide conduit labels on all feeder raceways as follows:
 - 1. Distribution Panels – “PANEL xxxx IN ROOM #xxx”.
 - 2. Panelboards – “PANEL xxxx FED FROM MDP xxx”.
- B. Fire Alarm Device Labels: As specified in Section 28 31 00.
- C. Low-Voltage System Device Labels: Provide label on each device, denoting device ID or address where applicable. Affix label to device faceplate for ceiling-mounted devices or wall-mounted devices above 8'-0" AFF. Affix label inside backbox for exterior devices.

3.4 WIRE IDENTIFICATION

- A. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identification shall be as follows:
 - 1. Markers shall be located within one inch of each cable end, except at panelboards, where markers for branch circuit conductors shall be visible without removing panel deadfront.
 - 2. Each wire and cable shall carry the same labeled designation over its entire run, regardless of intermediate terminations.
 - 3. Color code phases, neutral, and ground per NEC requirements and Section 26 05 19.
 - 4. Color-code all low-voltage system wires and cables in accordance with the individual sections in which they are specified.
 - 5. For power and lighting circuits, identify with branch circuit or feeder number.
 - 6. Fire Alarm Circuits: Provide cable markers showing NAC or SLC loop identification number at all fire alarm junction boxes and pullboxes.
 - 7. Provide cable markers on each cable, indicating device designation (e.g. “Camera 27”) for all security, and door control systems. Cables shall be labeled at each end, as well as at any intermediate junction boxes or pullboxes.
- B. Provide pull string markers at each end of all pull strings. Marker shall identify the location of the opposite end of the pull string.

3.5 JUNCTION BOX IDENTIFICATION

- A. Fire Alarm: In accessible ceiling spaces, exposed ceiling spaces, mechanical/electrical rooms, and other non-public spaces, paint fire alarm junction boxes and pullboxes with red spray paint. In all finished spaces where fire alarm boxes are visible, they shall be painted to match the surrounding finish. If there are any questions as to whether fire alarm boxes shall be painted red in a specific area, the Contractor shall get clarification from the Contracting Officer prior to painting.
- B. Label each lighting and power junction box with the panelboard name and circuit number.

- C. Label all junction boxes for door control systems with the type of system cables contained in the box.
- D. For junction boxes above ceilings, mark the box cover with the circuit or system designation using permanent black marker. For junction boxes in finished areas, mark the inside of the cover with the circuit or system designation using permanent black marker.

3.6 DEVICE PLATE IDENTIFICATION

- A. Label each receptacle device plate or point of connection denoting the panelboard name and circuit number.
- B. Install adhesive label on the top of each plate.

3.7 PANELBOARD IDENTIFICATION

- A. Provide panelboard circuit directories in accordance with Section 26 24 16.
- B. Install one-line and panel map adjacent to each MDP.

3.8 LOW-VOLTAGE SYSTEM IDENTIFICATION

- A. Install all labeling in accordance with the requirements of this section and of each section where the individual systems are specified.

3.9 WORKING CLEARANCE STRIPING

- A. Working clearance striping paint shall be applied in front of panels located in mechanical rooms, electrical rooms, storage rooms, and other non-public areas with exposed concrete floors.
- B. Striping paint shall not be applied in front of panels located in corridors and other public spaces, or spaces with finished floor surfaces (e.g., carpet, tile, vinyl, etc.).

END OF SECTION 26 05 53

SECTION 26 09 23
LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This Section includes stand-alone (non-networked) automatic lighting control devices.
 - 1. Occupancy sensor wall switches.
 - 2. Power Packs and Supplies.
 - 3. Outdoor Photocells.

1.2 RELATED SECTIONS

- A. Section 26 05 00 - Common Work Results for Electrical.
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
- D. Section 26 27 26 – Wiring Devices: Manual Light Switches.
- E. Section 26 51 00 – Interior Lighting.
- F. Section 26 52 00 – Emergency Lighting.
- G. Section 26 53 00 – Exterior Lighting

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include installation instructions for all sensors and switches, including any detailed programming information.
- B. Fixture Compatibility: Submitted occupancy sensors shall have wattage ratings to match the circuits on which they are connected and shall be compatible with submitted lamps and ballasts/drivers in the fixtures which they will control.
- C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals. Include manufacturer's installation and troubleshooting instructions.

1.4 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of all sensor and lighting control devices on the project record drawings.
- B. Operation and Maintenance Manuals: Submit manufacturer's instructions for occupancy sensor maintenance and adjustment.

1.5 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS – OCCUPANCY SENSORS

- A. Wattstopper.
- B. Sensor Switch.
- C. Hubbell.
- D. Leviton.
- E. Substitutions: Under provisions of Division 01.

2.2 OCCUPANCY SENSORS

- A. Wall-Mounted Dual-Technology Occupancy Sensor: Multi-technology PIR and ultrasonic or microphonic sensor with 1600 sq. ft. coverage area, white housing, self-adjusting settings, automatic dual-mode operation, built-in circadian calendar for testing, red/green LEDs for indication of PIR/ultrasonic or microphonic activity, and non-volatile memory to retain automatic and manual settings during power outages. Provide specific coverage area and either 180° or 360° coverage patterns, as required in the space to prevent unintentional tripping in adjacent spaces. Sensor shall have four selectable timer settings between 30 seconds and 20 minutes. Sensor shall retain all manually adjusted or “learned” settings in event of a power outage. .
- B. Sensor Masking: Infrared and dual-technology sensors shall include masking segments for adjusting the coverage of the infrared sensor to avoid false-tripping. If masking is not included with sensor, it shall be provided by Contractor at no additional cost to the Government.

2.3 POWER (RELAY) PACKS AND SUPPLIES

- A. Sensor Power Packs: Provide sensor power packs as recommended by the sensor manufacturer and as required for all connected devices and the specified sequence of operation. Note that control of fixtures with multi-level switching may require additional power packs. Power Packs shall be UL listed, plenum rated, and accept 120 VAC.

2.4 ACCEPTABLE MANUFACTURERS – OUTDOOR PHOTOCELLS

- A. Intermatic.
- B. Tork.
- C. Substitutions: Under provisions of Division 01.

2.5 OUTDOOR PHOTOCELLS

- A. Dusk-to-dawn lighting control with a delay action.
- B. Sonic-welded polycarbonate case and lens to seal out moisture.
- C. Fully enclosed weatherproof housing.
- D. Suitable for controlling LED luminaires. Rated minimum 600W, 120/277V.
- E. Rated for mounting on building exterior and -20°F temperature operation.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install occupancy sensor wall switches 48 inches above floor.
- B. Unless otherwise noted install wall sensor switches within 6 inches of the door jamb on the strike side, however the final layout shall be coordinated with furniture and equipment locations to avoid false OFF signals, due to obstruction of sensors.
- C. Locate power packs and similar devices in concealed, accessible areas.
- D. Install outdoor photocells on a Nema 4 enclosure and locate on the north side of the building turned away from artificial light sources, in accordance with the manufacturer's installation instructions. Do not install the photocell so that it directly faces the midday sun. Field adjust slider to turn lights On at dusk and OFF at dawn.

3.2 SENSOR TESTING AND CALIBRATION

A. Occupancy Sensors:

1. Activate test setting on sensor. Walk past the room entrance and confirm that the sensor is not picking up unwanted motion from adjacent spaces such as hallways. Provide masking on infrared lens to restrict field of view if necessary and re-test.
2. Walk into room and confirm that the sensor immediately picks up the motion and turns the lights ON.
3. Walk around the room and confirm that the sensor is picking up small motion. Relocate sensor or add additional sensors as required to provide complete coverage throughout the space.
4. Adjust the PIR and ultrasonic or microphonic sensitivity settings as required to avoid false tripping due to air movement.
5. Adjust range on sensor to match room size, as a percentage of total sensor coverage. Example: For a 10' x 10' room, the maximum sensing distance in front of the sensor (40') is adjusted down to the minimum setting of 36% coverage.
6. Confirm that the sensor is performing the lighting control sequence of operation as noted on the Plans. Make adjustments as required until the sequence is met.
7. Put sensor back into normal mode.

3.3 LIGHTING CONTROL SEQUENCE OF OPERATIONS

1. See Plans for lighting control sequence for each space. Provide all programming, adjustment and field changes as required to perform the specified lighting control sequence.
2. Where no lighting control sequences are shown on the Plans, coordinate with the Contracting Officer to determine if the occupancy sensor default factory settings are suitable for their needs in each space and adjust accordingly.

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
2. Operational Test: Verify operation of each lighting control device, and adjust time delays.

B. Lighting control devices that fail tests and inspections are defective work.

3.5 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit occupied conditions.

3.6 DEMONSTRATION

- A. Train Government maintenance personnel to adjust, operate, and maintain lighting control devices. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 26 09 23

SECTION 26 09 33

CENTRAL DIMMING CONTROLS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. This section includes a new dimming panelboard and dimming control stations to serve the exhibit and theater lighting.
- B. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 1 General Requirements.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 – Low-Voltage Electrical Power and Cables
- C. Section 26 05 33 - Raceways and Boxes.
- D. Section 26 05 53 – Identification for Electrical Systems
- E. Section 26 09 23 – Lighting Control Devices.
- F. Section 26 51 00 – Interior Lighting

1.3 REFERENCE STANDARDS

- A. NFPA 70 National Electrical Code

1.4 SUBMITTALS

- A. Product Data: Include dimensions and data on features and components for each product specified. Include wiring diagrams, plan and elevation view of dimming cabinets and controllers showing control and indicating devices. Include catalog cut sheets and data on ratings and a detailed description of operating modes and any load limitations that may apply.
- B. Dimmer Compatibility: **Manufacturer shall confirm in writing that the dimmers supplied are fully compatible with luminaires controlled for smooth, flicker-free dimming.**

- C. Record of field tests covering tests and commissioning efforts required by NFPA 70 and Part 3 of this Section.
- D. Special Project Warranties: As specified in this Section.
- E. Provide 1/4" scale plan of room where equipment is located with overall equipment dimensions.

1.5 QUALITY ASSURANCE

- A. Listing and Labeling: Provide dimming control panels and controllers specified in this Section that is listed and labeled.
 - 1. The terms "Listed" and "Labeled": As defined in NFPA 70, Article 100.
 - 2. Listing and Labeling Agency Qualifications: A "Nationally Recognized Testing Laboratory" as defined in OSHA Regulation 1910.7.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in dimming systems for a minimum of three (3) years documented experience in Alaska.
- B. All components and panels shall be UL listed, shall be manufactured by a UL listed panel shop, offer a minimum three (3) year warranty and meet all state and local code requirements.
- C. Dimming control panel, components and assemblies shall be assembled and fully factory tested prior to shipment and installation.

1.7 COORDINATION

- A. Coordinate exact dimmer types with all luminaires controlled during preparation of submittals.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression system, and partition assemblies.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Contracting Officer of other rights the Contracting Officer may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: A written warranty, signed by Contractor and manufacturer, agreeing to replace equipment that does not meet requirements or that fail within the specified warranty period.
 - 1. Warranty Period: 2 years from date of Substantial Completion.

1.9 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of all power packs, lighting control devices and accessories on the project record drawings.
- B. Operation and Maintenance Manuals:
 - 1. Provide recommended sensor cleaning schedule.
 - 2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
 - 3. Provide lighting control manufacturer's operating and installation instructions and troubleshooting guide.
 - 4. Include any specific warranty information provided by the manufacturer.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Lutron
 - 2. ETC
 - 3. Leviton
- B. Basis of Design: Size, configuration, and wiring diagrams of dimmer cabinet and controller shown on Plans are based on Lutron #GP series dimmer cabinet and Lutron #Grafik Eye 4516 series controller.

2.2 GENERAL

- A. Provide system hardware that is designed, tested, manufactured, and warranted by a single manufacturer.
- B. Architectural Lighting Controls: Ten-year operational life while operating continually at any temperature in an ambient temperature range of 0° C (32°F) to 40° C (104°F) and 90 percent non-condensing relative humidity.
- C. Designed and tested to withstand electrostatic discharges up to 15,000 V without impairment per IEC 801-2.

2.3 DIMMING / RELAY PERFORMANCE REQUIREMENTS

- A. Electrolytic capacitors to operate at least 20° C below the component manufacturer's maximum temperature rating when device is under fully-loaded conditions in 40° C (104° F) ambient temperature.
- B. Load Handling Thyristors (SCRs and triacs), Field Effect Transistors (FETs), and Isolated Gate

Bipolar Transistors (IGBTs): Manufacturer's maximum current rating minimum two times control's rated operating current.

- C. Capable of withstanding repetitive inrush current of 50 times operating current without impacting lifetime of dimmer/relay.
- D. Design and test dimmers/relays to withstand line-side surges without impairment to performance.
 - 1. Panels: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 3,000 amps per ANSI/IEEE C62.41B.
 - 2. Other power handling devices: Withstand surges without impairment of performance when subjected to surges of 6,000 volts, 200 amps per ANSI/IEEE C62.41C.
- E. Utilize air gap off, activated when user selects "off" at any control to disconnect the load from line supply.
- F. Possess power failure memory such that if power is interrupted and subsequently returned, lights will automatically return to same levels (dimmed setting, full on, or off) prior to power interruption within 3 seconds.
- G. Dimmers:
 - 1. Multiple load type, tested to UL 508 to specifically control incandescent/tungsten, magnetic low voltage, electronic low voltage, neon/cold cathode, fluorescent dimming ballasts, led dimming ballasts and non-dim loads.
 - 2. Each dimmer to be assigned a load type that will provide a proper dimming curve for the specific light source.
 - 3. Possess ability to have load types assigned per circuit, configured in field.
 - 4. Minimum and maximum light levels user adjustable on circuit-by-circuit basis.
 - 5. Control all light sources in smooth and continuous manor. Dimmers with visible steps are not acceptable.
 - 6. Provide real-time cycle-by-cycle compensation for incoming line voltage variations including changes in RMS voltage (plus or minus 2 percent change in RMS voltage/cycle), frequency shifts (plus or minus 2 Hz change in frequency/second), dynamic harmonics, and line noise. Systems not providing cycle-by-cycle compensation to include external power conditioning equipment to meet these requirements.
 - 7. Systems not providing cycle-by-cycle compensation to include external power conditioning equipment as part of dimming system.
 - 8. Each dimmer to incorporate electronic "soft-start" default at initial turn-on that smoothly ramps lights up to the appropriate levels within 0.5 seconds.
 - 9. Line Voltage Dimmers; Meet following load-specific requirements:
 - a. Magnetic Low Voltage (MLV) transformer:
 - 1) Contain circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472, Section 5.11.
 - 2) Dimmers using back-to-back SCR construction that could fail open causing DC power to flow into magnetic low voltage load are not acceptable.
 - b. Electronic Low Voltage (ELV) transformer: Dimmer to operate electronic low voltage transformers via reverse phase control. Alternately, forward phase control dimming may be used if dimming equipment manufacturer has recommended

specific ELV transformers being provided.

c. Neon and cold cathode transformers:

- 1) Magnetic transformers: UL listed for use with normal (low) power factor magnetic transformers. Electronic transformers: Must be supported by the ballast equipment manufacturer for control of specific ballasts being provided.

10. Low Voltage Dimming Modules; Meet following requirements:

- a. Coordination between low voltage dimming module and line voltage relay: Capable of being electronically linked to single zone.
- b. Single low voltage dimming module; capable of controlling following light sources:
 - 1) 0-10V analog voltage signal.
 - a) Provide Class 2 isolated 0-10V output signal conforming to IEC 60929.
 - b) Sink current via IEC 60929.
 - c) Source current.
 - 2) 10-0V reverse analog voltage signal.
 - 3) DSI digital communication.
 - 4) DALI broadcast communication IEC 60929:
 - a) Logarithmic intensity values in compliance with IEC 60929.
 - b) Linear intensity values for use with LED color intensity control.
 - 5) PWM IEC 60929.

H. Non-dim circuits to meet the following requirements:

1. Rated life of relay: Minimum 1,000,000 cycles.
2. Load switched in manner that prevents arcing at mechanical contacts when power is applied to load circuits.
3. Fully rated output continuous duty for inductive, capacitive, and resistive loads.

2.4 POWER PANELS

A. Product: Lutron GP Series.

B. Mechanical:

1. Listed to UL 508 as industrial control equipment. CSA certified, NOM approved, or CE marked as applicable.
2. Delivered and installed as a UL listed factory assembled panel.
3. Field wiring accessible from front of panel without need to remove dimmer assemblies or other components.
4. Panels passively cooled via free-convection, unaided by fans or other means.
5. Ship panels with each dimmer in mechanical bypass position by means of jumper bar inserted between input and load terminals. Jumpers to carry full rated load current and be reusable at any time. Mechanical bypass device to allow for switching operation of connected load with dimmer removed by means of circuit breaker.

C. Electrical:

1. Panels contain branch circuit protection for each circuit unless the panel is a dedicated feed-through type panel or otherwise indicated on the drawings.

2. Branch circuit breakers; meet following performance requirements:
 - a. Listed to UL 489 as molded case circuit breaker for use on lighting circuits.
 - b. Contain visual trip indicator; rated at 10,000 AIC.
 - c. Thermal-magnetic construction for overload, short-circuit, and over-temperature protection. Use of breakers without thermal protection requires dimmers/relays to have integral thermal protection to prevent failures when overloaded or ambient temperature is above rating of panel.
 - d. Accept tag-out/lock-out devices to secure circuit breakers in off position when servicing loads.
 - e. Replaceable without moving or replacing dimmer/relay assemblies or other components in panel. UL listed as switch duty (SWD) so that loads can be switched on and off by breakers.
3. Minimum UL listed Short Circuit Current Rating (SCCR) of 22,000A.

D. Lutron GP Series Grafik Panel:

1. Utilize universal 16A continuous-use UL listed dimmer.
2. Limit current rise time to minimum 350 μ sec as measured from 10-90 percent of load current waveform and minimum 525 μ sec as measured from 0-100 percent of load current waveform at 50 percent rated dimmer capacity at a 90 degree conduction angle. Current rise to be minimum 400 μ sec as measured from 10-90 percent of load current waveform and minimum 600 μ sec as measured from 0-100 percent of load current waveform at 100 percent rated dimmer capacity at a 90 degree conduction angle.
3. Load faults only affect the given circuit.
4. Tested 100 percent for proper operation at three stages;
 - a. Function test each printed circuit board.
 - b. Function test fully assembled panel.
 - c. Final assembly burn in for two hours at 40° C (104° F) ambient temperature.

E. Diagnostics and Service:

1. Replacing dimmer/relay does not require re-programming of system or processor.
2. Dimmers/relays: Include diagnostic LED's to verify proper operation and assist in system troubleshooting.
3. Dimming/relay panels: Include tiered control scheme for dealing with component failure that minimizes loss of control for occupant.
 - a. If lighting control system fails, lights to remain at current level. Panel processor provides local control of lights until system is repaired.
 - b. If panel processor fails, lights to remain at current level. Circuit breakers can be used to turn lights off or to full light output, allowing non-dim control of lights until panel processor is repaired.
 - c. If dimmer fails, factory-installed mechanical bypass jumpers to allow each dimmer to be mechanically bypassed. Mechanical bypass device to allow for switching operation of connected load with dimmer removed by means of circuit breaker.

2.5 EMERGENCY LIGHTING BYPASS

- A. Provide UL 924 emergency lighting bypass where shown on plans.

2.6 LOW-VOLTAGE WALL STATIONS

- A. Product: Preset Lighting Controls with Zone Override
- B. Electronics:
 - 1. Use RS485 wiring for low voltage communication.
- C. Functionality:
 - 1. Upon button press, LEDs to immediately illuminate.
 - 2. LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or the LEDs turn off if the button press was not processed.
 - 3. Allow for easy reprogramming without replacing unit.
 - 4. Replacement of units does not require reprogramming.
- D. Color:
 - 1. Custom color to be selected.
 - 2. Color variation in same product family: Maximum $\Delta E=1$, CIE L*a*b color units.
 - 3. Visible parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.
- E. Provide faceplates with concealed mounting hardware.
- F. Engrave wall stations with appropriate button, zone, and scene engraving descriptions furnished prior to fabrication.
- G. Silk-screened borders, logos, and graduations to use graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.
- H. Preset Lighting Control with Zone Override; Lutron Grafik Eye GRX-4500:
 - 1. Intensity for each zone indicated by means of one illuminated bar graph per zone.
 - 2. Fade time indicated by digital display for current scene while fading.
 - 3. Incorporate built-in wide angle infrared receiver.
 - 4. For temporary local overrides, individual raise/lower buttons to allow zones to be adjusted without altering scene values stored in memory.
- I. Provide faceplates with concealed mounting hardware.
- J. Engrave wall stations with appropriate button, zone, and scene engraving descriptions furnished prior to fabrication.

- K. Silk-screened borders, logos, and graduations to use graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.

2.7 LOW VOLTAGE CONTROL INTERFACES

- A. Contact Closure Interfaces; Lutron Model GRX-AV, GRX-CCO-8, and seeTouch keypads SG-xx:
 - 1. Where contact closures are used to integrate between lighting controls and other systems:
 - a. Input open circuit voltage not to exceed 36V.
 - b. Input short circuit current not to exceed 0.5 mA.
 - c. Mechanical contact closures to be dry contact rated.
 - d. Solid state contact closures:
 - 1) Output off-state leakage current not to exceed 50mA.
 - 2) Output on-state saturation voltage not to be less than 2V.
 - e. The contact closure input device will accept both momentary and maintained contact closures.

2.8 SOURCE QUALITY CONTROL

- A. Perform full-function testing on completed assemblies at end of line. Statistical sampling is not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. The Contractor shall locate, install, wire and program the dimming as indicated in the contract drawings, specifications and in accordance with the manufacturer's installation and operation instructions.
- B. The Contractor shall check all wiring to lighting fixtures or other electrical loads for short circuits prior to termination of line and load to the dimming. Replacement of damaged dimming system components due to faulty installation shall be the sole responsibility of the Contractor.
- C. Proper judgment must be exercised in executing the installation and commissioning of the system so as to ensure the best possible installation and programming of the dimming system. The Contractor shall also provide, at the Contracting Officer facility, the training necessary to familiarize the Contracting Officer personnel with the operation, use, adjustment, programming, and problem solving diagnosis of the dimming system
- D. Clearance: According to manufacturer's written instructions, but not less than 36 inches in front of unit.
- E. Bond equipment cabinets to building grounding electrode system per drawings.
- F. Install nameplate label in accordance with Section 26 05 53 - Electrical Identification.

3.2 INSTRUCTION OF OPERATION PERSONNEL

- A. Provide the Contracting Officer authorized personnel with operation and maintenance instructions for the dimming system as specified in Section 26 05 00.

3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Supervision of unit installation, connections, and adjustments by a factory-authorized service representative. Report results in writing.
- B. Tests: Perform tests listed below according to manufacturer's written instructions. Test unit functions, operations, and protective features. Adjust to ensure operation complies with Specifications. Perform tests on completion of unit installation and after building circuits have been energized. Provide instruments to permit accurate observation of tests.
- C. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.4 CLEANING

- A. On completion of installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and abrasions in finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Contracting Officer maintenance personnel to adjust, operate, and maintain units.
 - 1. Conduct a minimum of 4 hours' training.
 - 2. Schedule training with Contracting Officer with at least 7 days' advance notice.

END OF SECTION 26 09 33

SECTION 26 24 16

PANELBOARDS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Lighting and Appliance Branch Circuit Panelboards.
- B. Load Centers.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- C. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

- A. NEMA AB 1 - Molded Case Circuit Breakers.
- B. NEMA PB 1 - Panelboards.
- C. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- D. NEMA PB 2.2 - Application Guide for Ground-fault Protective Devices for Equipment.
- E. UL 50 – Enclosures for Electrical Equipment.
- F. UL 67 – Panelboards.
- G. UL 98 - Enclosed and Dead-front Switches.
- H. UL 489 – Molded Case Circuit Breakers and Circuit Breaker Enclosures.
- I. Federal Specification W-C-375B/Gen – Circuit Breakers, Molded Case, Branch Circuit and Service.

1.4 SUBMITTALS

- A. Submit data under provisions of Division 01 and Section 26 05 00.
- B. Product Data: Submit product data for all components provided which fall under this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.
- C. Shop drawings: Submit shop drawings for each panelboard indicating features and device arrangement and size. Include outline and support point dimensions, voltage, main bus ampacity, and integrated short circuit ampere rating.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Division 01.
- B. Upon arrival at the site inspect equipment and report on any damage.
- C. Handle carefully on site to avoid any damage to internal components, enclosures and finishes.
- D. Store in a clean, dry environment. Maintain factory packaging and provide an additional heavy canvas or plastic cover to protect enclosures from dirt, water, construction debris and traffic.

1.6 OPERATION AND MAINTENANCE MATERIALS

- A. Submit data under provisions of Division 01 and Section 26 05 00.
- B. Provide product data and shop drawing information including replacement parts list.
- C. Provide installation, operation and maintenance information per manufacturer.
- D. Project record data: Submit final record panel schedules as hardcopy and in Microsoft Excel format.

1.7 WARRANTY

- A. Manufacturer shall warrant specified equipment to be free of defects for a period of one year from the date of installation.

1.8 SPARE PARTS

- A. Keys: Furnish 2 each to Contracting Officer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - PANELBOARDS

- A. Square D.
- B. Cutler Hammer.
- C. General Electric.
- D. Siemens.
- E. Substitutions: Under provisions of Division 01.

2.2 BRANCH CIRCUIT PANELBOARDS

- A. Lighting and Appliance Branch Circuit Panelboards: NEMA PB 1; circuit breaker type.
- B. Enclosure: NEMA PB 1; Type 1 or 3R as indicated on Drawings. Boxes shall be galvanized steel constructed in accordance with UL50 requirements. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
- C. Cabinet Size: 6 inches deep; 20 inches wide minimum.
- D. Provide surface cabinet front as indicated on the Drawings with concealed trim clamps, concealed hinge and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.
- E. Provide panelboards with copper bus, ratings as scheduled on Drawings. Provide one continuous bus bar per phase each. Panelboards shall have sequentially phased branch circuit connectors suitable for bolt-on branch circuit breakers. Bussing shall be fully rated.
- F. Integrated Short Circuit Rating: Provide panelboards with short circuit ratings as shown on the Drawings. Minimum ratings shall be 10,000 amperes RMS symmetrical for 250 volt panelboards; 14,000 amperes RMS symmetrical for 600 volt panelboards.
- G. Main/Sub Feed Circuit Breakers: NEMA AB 1; Provide vertical mount main and/or sub feed circuit breaker in panelboards as shown on the drawings.
 - 1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free. Automatic tripping of the breaker shall be clearly indicated by the handle position. Contacts shall be nonwelding silver alloy and arc extinction shall be accomplished by means of DE-ION arc chutes. A push-to-trip button on the front of the circuit breaker shall provide a local manual means to exercise the trip mechanism.
 - 2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 °C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.

- H. Branch Circuit Breakers: NEMA AB 1; Provide panelboards with bolt-on type thermal magnetic trip circuit breakers.
1. Circuit breakers shall be operated by a toggle-type handle and shall have a quick-make, quick-break over-center switching mechanism that is mechanically trip-free with common trip handle for all poles.
 2. Lugs shall be UL Listed to accept copper and aluminum conductors and shall be suitable for 90°C rated wire, sized according to the 75 °C temperature rating per NEC Table 310-16. Lug body shall be bolted in place.
 3. Provide circuit breakers UL listed as type HACR for use with heating, air conditioning and refrigeration equipment.
 4. Provide UL Class A ground fault interrupter circuit breakers where scheduled on Drawings.

2.3 PANELBOARD IDENTIFICATION

- A. For each panelboard and each existing panelboard where circuits are added or modified, provide typed schedule denoting each circuit load by the load type and final name and room number. Schedule shall not be typed with names shown on the Contract Drawings unless names are acceptable to the Contracting Officer.
- B. Provide panel schedule in O&M manual for every new panelboard and every existing panelboard where circuits are added or modified.
- C. All panelboards shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

- D. Provide electronic copies of all panel schedules in Microsoft Excel format, submitted with the O&M manuals.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install panelboards plumb and flush with wall finishes, in conformance with NEMA PB 1.1.
- B. Height: 6 feet, 6 inches to top of panelboard.
- C. Provide filler plates for unused spaces in panelboards.
- D. Panel Schedules: Revise schedules to reflect circuiting changes required to balance phase loads.

- E. Stub 5 empty one inch conduits to accessible location above ceiling out of each recessed panelboard.

3.2 FIELD QUALITY CONTROL

- A. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 20 percent, rearrange circuits in the panelboard to balance the phase loads within 20 percent. Take care to maintain proper phasing for multi-wire branch circuits.
- B. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers.

END OF SECTION 26 24 16

SECTION 26 27 26

WIRING DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wall Switches.
- B. Receptacles.
- C. Device Plates and Box Covers.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 - General Requirements and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 26 – Grounding and Bonding for Electrical Systems.
- C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- D. Section 26 05 33.16 – Boxes for Electrical Systems.
- E. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. FS W-C-596 – Federal Specification for Electrical Power Connector, Plug, Receptacle, and Cable Outlet.
- B. FS W-S-896 – Federal Specification for Switches, Toggle (Toggle and Lock), Flush Mounted.
- C. NEMA WD 1 - General Color Requirements for Wiring Devices.
- D. ANSI/NEMA WD 6 – Wiring Devices – Dimensional Requirement.
- E. UL 20 – General-Use Snap Switches.
- F. UL 498 - Attachment Plugs and Receptacles.
- G. UL 943 – Ground-Fault-Circuit-Interrupters.

1.4 SUBMITTALS

- A. Product Data: Submit product data for all components provided that are specified in this section showing configurations, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of all wiring devices on the project record drawings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - WALL SWITCHES

- A. Hubbell.
- B. Leviton.
- C. Pass & Seymour.
- D. Substitutions: Under provisions of Division 01.

2.2 WALL SWITCHES

- A. Wall Switches for Lighting Circuits: UL 20; NEMA WD 1; and Federal Specification FS W-S-896 AC industrial grade snap switch with toggle handle, rated 20 amperes and 120-277 volts AC. Handle: White nylon. Provide single-pole, 3-way, or 4-way switches as indicated on Plans.

2.3 ACCEPTABLE MANUFACTURERS - RECEPTACLES

- A. Hubbell.
- B. Leviton.
- C. Pass & Seymour.
- D. Substitutions: Under provisions of Division 01.

2.4 RECEPTACLES

- A. Convenience and Straight-blade Receptacles: UL 498, NEMA WD 1 and Federal Specification FS W-C-596 industrial grade receptacle.

- B. Locking-Blade Receptacles: NEMA WD 5.
- C. Convenience Receptacle Configuration: NEMA WD 1; Type 5-20R, white nylon face.
- D. GFCI Receptacles: 20A, duplex convenience receptacle with integral class 'A' ground fault current interrupter, LED indicator lamp and integral lockout.
- E. Weather-Resistant Receptacles: Listed to the weather-resistant supplement of UL498 and complying with the requirements of NEC 406.9.

2.5 DEVICE PLATES

- A. Decorative Cover Plate: Smooth 430 or 302 stainless steel. with metal, counter sunk screws to match device plate.
- B. Weatherproof Cover Plate: UL listed, cast aluminum, hinged outlet cover/enclosure, with gasket between the enclosure and the mounting surface, suitable for wet locations while in use.
- C. Exposed Work Cover Plate: ½ inch raised, square, pressed, galvanized or cadmium plated steel cover plate supporting devices independent of the outlet box.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install wall switches 48 inches above floor, OFF position down.
- B. Unless otherwise noted install wall switches within 6 inches of the door jamb on the strike side.
- C. Install convenience receptacles 18 inches above floor, 4 inches above counters or backsplash, grounding pole on bottom.
- D. Install specific-use receptacles at heights shown on Contract Drawings.
- E. Unless otherwise noted, mounting heights are for finished floor to center line of outlet.
- F. Drill opening for poke-through fitting installation in accordance with manufacturer's instructions.
- G. Install decorative plates on switch, receptacle, and blank outlets in finished areas. Use midsize or jumbo plates for outlets installed in masonry walls, where required to cover up imperfections in the wall opening.
- H. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface-mounted outlets.
- I. Install devices and wall plates flush and level.

- J. Ground receptacles to boxes with a grounding wire. Grounding through the yoke or screw contact is not an acceptable alternate to the ground wire.

END OF SECTION 26 27 26

SECTION 26 29 13
ENCLOSED CONTROLLERS

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Manual Motor Starters.

1.2 RELATED WORK

- A. Division 21 – Fire Suppression.
- B. Division 22 – Plumbing.
- C. Division 23 – Heating, Ventilating, and Air Conditioning (HVAC).
- D. Section 26 05 48 – Vibration and Seismic Controls for Electrical Systems.
- E. Section 26 05 29 – Hangers and Supports for Electrical Systems.
- F. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements.
- B. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.
- C. NEMA AB 1 - Molded Case Circuit Breakers.
- D. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.
- E. NEMA KS 1 - Enclosed Switches.

1.4 SUBMITTALS

- A. Submit shop drawings and product data under provisions of Division 01.
- B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

- C. Submit manufacturers' instructions under provisions of Division 01.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 01.
- B. Include recommended maintenance procedures and intervals.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - MOTOR STARTERS

- A. Square D.
- B. Allen Bradley.
- C. Siemens.
- D. Cutler Hammer.
- E. Substitutions: Under provisions of Division 01.

2.2 MANUAL MOTOR STARTERS

- A. Fractional Horsepower Manual Starter: NEMA ICS 2; AC general-purpose Class A manually operated, number of poles as required by the load served, full-voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator.

2.3 MAGNETIC MOTOR STARTERS

- A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower.
- B. Full Voltage Starting: Non-reversing type.
- C. Coil Operating Voltage: 120 volts, 60 Hertz.
- D. Size: NEMA ICS 2; size as required by the load served.
- E. Overload Relay: NEMA ICS 2; solid state, with 3 to 1 adjustment for trip current and phase loss and unbalance protection.
- F. Enclosure: NEMA ICS 6; Type 1 or 3R as shown on the drawings.
- G. Combination Motor Starters: Combine motor starters with motor circuit protector.

- H. Auxiliary Contacts: NEMA ICS 2; two field convertible contacts in addition to seal-in contact.
- I. Pushbuttons: NEMA ICS 2; START/STOP in front cover.
- J. Indicating Lights: NEMA ICS 2; RUN: red LED light in front cover.
- K. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO, in front cover.
- L. Control Power Transformers: 120 volt secondary, VA capacity as required by the load served in each motor starter.
- M. Power Monitor: Include a three-phase power monitor in each magnetic starter connected to shut down the motor on loss of any phase, phase reversal, or low voltage on any phase. Power monitor shall automatically reset and restart motor when phase and voltage conditions return to normal. Provide oversize starter enclosures as required to install power monitor.

2.4 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

- A. Motor Circuit Protector: NEMA AB 1; circuit breakers with integral instantaneous magnetic trip in each pole.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install motor control equipment in accordance with manufacturer's instructions.
- B. Select and install heater elements in motor starters to match installed motor characteristics
- C. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
- D. After final connections are made, check and correct the rotation of all motors.
- E. Field adjust the trip settings of all motor starter magnetic trip only circuit breakers to approximately 11 times motor full load current. Determine full load current from motor nameplate following installation
- F. Motor starting equipment shall be listed for use with the motors specified under Division 21, 22, 23.

END OF SECTION 26 29 13

SECTION 26 51 00
INTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Interior Luminaires and Accessories.
- B. Lamps.
- C. Drivers.

1.2 RELATED WORK

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Division 09 – Finishes: Painting and ceilings.
- C. Section 26 05 26 - Grounding and Bonding for Electrical Systems.
- D. Section 26 05 29 - Hangers And Supports For Electrical Systems.
- E. Section 26 52 00 - Emergency Lighting.
- F. Section 26 56 00 – Exterior Lighting.

1.3 REFERENCES

- A. ANSI C62.41 – Specification for Surge Voltages in AC Power Circuits Rated up to 600V.

1.4 SUBMITTALS

- A. Product Data: Submit the following:
 - 1. Luminaires: Include manufacturer's product data sheets and/or shop drawings including outline drawings showing support points, weights, and accessory information for each luminaire type.
 - 2. Screw-in LED bulb: Submit product data for approval.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of all lighting fixtures and accessories on the project record drawings.
- B. Operation and Maintenance Manuals:
 - 1. Provide recommended luminaire cleaning and re-lamping schedule. If any luminaire lenses require special lubricants for cleaning, include this in the schedule.
 - 2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
 - 3. Provide luminaire manufacturer's installation instructions.
 - 4. Include any specific warranty information provided by the manufacturer for luminaires, lamps and drivers.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site, store and protect under provisions of Division 01.

1.7 EXTRA STOCK

- A. Provide spare parts under provisions of Division 01.
- B. Lenses: One of each size and type.

PART 2 - PRODUCTS

2.1 INTERIOR LUMINAIRES AND ACCESSORIES

- A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.
- B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in return air plenums, direct contact with insulation, or in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.
- C. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation.
- D. Luminaires using a metal halide lamp other than a thick-glass parabolic reflector lamp (PAR) shall be provided with a containment barrier that encloses the lamp, or shall be provided with a physical means that only allows the use of a lamp that is Type 'O' (listed for use in open luminaires).

2.2 ACCEPTABLE MANUFACTURERS - LAMPS

- A. Phillips Lighting Company.
- KEFJ 184638

- B. Osram Sylvania.
- C. General Electric.
- D. Venture Lighting International.
- E. Substitutions: Under provisions of Division 01.

2.3 LAMPS – LED

- A. Screw-in LED Replacement Lamps: As scheduled on Plans or equal.
- B. Light Emitting Diode (LED): 3500 ° K, with minimum 75CRI and a minimum rated life of 50,000 hours at 75 degrees F average indoor ambient temperature, -20 degrees F for outdoors.

2.4 DRIVERS – LED

- A. Provide UL listed power supply as recommended by the LED fixture manufacturer for operation of the specified LED lamps. Power supply shall be integral to the luminaire unless otherwise noted on the Plans. Power supply shall be dual voltage (120/277V) where available or operate at the supply voltage indicated on the Plans.
- B. LED Dimming Drivers: Provide UL listed 0-10V dimming driver as recommended by the LED fixture manufacturer for operation of the specified LED lamps, fully compatible with the dimming system or dimming switch controlling the fixture. Driver shall be integral to the fixture and capable of dimming the luminaire to 1% output minimum unless otherwise scheduled on the Plans. Power supply shall be dual voltage (120/277V) where available and operate at the supply voltage indicated on the Plans

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lamps in luminaires and lampholders.
- B. Support surface-mounted luminaires directly from building structure.
- C. Install recessed luminaires to permit removal from below. Use plaster frames in hard ceilings.
- D. Support luminaries in suspended ceilings from structure above in accordance with Section 26 05 29.
- E. Rigidly align continuous rows of lighting fixtures for true in-line appearance.
- F. Mechanical Rooms: Lighting fixture locations shown on Plans in mechanical and electrical equipment rooms are approximate. Coordinate mounting height and location of lighting fixtures to clear mechanical, electrical and plumbing equipment and to adequately illuminate

meters, gauges and equipment. Support all lighting fixtures independently of duct work or piping.

- G. Tandem wiring: Provide factory harness for all tandem mounted light fixtures.
- H. LED Power Supplies: Install power supplies to be readily accessible. Where power supplies are installed in plenum areas, provide plenum rated listing.
- I. Pendant Mounted Track or Luminaires: Evaluate seismic criteria per Section 26 05 48 and provide seismic splays as required.

3.2 RELAMPING

- A. Re-lamp luminaires that have failed lamps at completion of Work.

3.3 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Touch up luminaire finish at completion of work.

END OF SECTION 26 51 00

SECTION 26 52 00
EMERGENCY LIGHTING

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Emergency Lighting Units.
- B. Emergency Exit Signs.
- C. Emergency Ballast Power Supplies.
- D. Emergency Lighting Inverters.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- C. Section 26 05 33 - Raceway and Boxes for Electrical Systems.
- D. Section 26 05 53 – Identification for Electrical Systems.
- E. Section 26 51 00 – Interior Lighting.
- F. Section 26 56 00 – Exterior Lighting.

1.3 REFERENCE STANDARDS

- A. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures.
- B. NECA/IESNA 500 – Recommended Practice for Installation Indoor Commercial Lighting System.
- C. UL 924 - Emergency Lighting and Power Equipment.

1.4 REGULATORY REQUIREMENTS

- A. Conform to State and local building code and NFPA 101 for installation requirements.

- B. Furnish emergency lighting units and exit signs that are UL 924 listed and labeled for their indicated use and location on this project.

1.5 WARRANTY

- A. Emergency Lighting Units: Submit a warranty, mutually executed by the manufacturer and the installer, agreeing to replace emergency lighting units that fail in materials or workmanship within five years, beginning on the date of manufacturer.
- B. LED Exit Signs: Submit a warranty, mutually executed by the manufacturer and the installed, agreeing to replace LED exit signs that fail in materials or workmanship within five years, beginning on the date of substantial completion.
- C. Emergency Ballasts and Inverters: Three year warranty minimum.

1.6 SUBMITTALS

- A. Product Data: Submit product data under describing emergency lighting including data substantiating that materials comply with specified requirements. Arrange data for luminaires in the order of fixture designation.
- B. Provide product data on emergency lighting units, exit signs, emergency ballasts, and emergency lighting inverters.
- C. Performance Curves/Data: Submit certified photometric data for emergency lighting units.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Manuals: Submit maintenance instructions for inclusion in the operating and maintenance manuals.

PART 2 - PRODUCTS

2.1 EMERGENCY LIGHTING UNITS

- A. Provide emergency lighting units as scheduled on the Plans or approved equal.

2.2 EXIT SIGNS

- A. Provide exit signs as scheduled on the Plans or approved equal.

2.3 ACCEPTABLE MANUFACTURERS –EMERGENCY DRIVERS

- A. Bodine.

- B. Iota.
- C. Lithonia.
- D. Substitutions: Under provisions of Division 01.

2.4 EMERGENCY DRIVERS

- A. LED Unit: UL listed self-contained emergency LED driver with automatic transfer to battery supply on power failure, optional test switch, AC ON pilot light, fully-automatic two-rate charger, ni-cad battery, and power supply capable of operating an LED load of up to the rated fixture wattage (as shown on the Plans) at rated current (700mA) for a minimum of 90 minutes. Bodine #BSL series or approved equal.
- B. Test Switches:
 - 1. Standard and Low-Profile Units:
 - a. Pendant Fixtures: Mount test switch in end cap of fixture, at end closest to ballast. Affix red ballast identification label (supplied with ballast) to bottom of fixture housing below test switch to denote location of emergency ballast.
 - 2. High Output Unit: Self-testing, as specified above.
 - 3. Recessed Downlights: Mount test switch in ceiling, in recessed single-gang box adjacent to downlight.

2.5 ACCEPTABLE MANUFACTURERS- EMERGENCY LIGHTING INVERTERS

- A. Bodine
- B. Iota
- C. Isolite
- D. Dual-lite
- E. Substitutions: Under provisions of Division 01.

2.6 EMERGENCY LIGHTING INVERTERS

- A. UL 924 compliant, full output emergency lighting inverter capable of operating the lamps at >90% lumen output for 90 minutes with field selectable 120 volt input and output, with pure sinusoidal wave output suitable for use with LED luminaires, maintenance free lead calcium batteries, low voltage battery disconnect, test button, LED indicators, with surface mounting and minimum wattage as indicated on Plans.

- B. The inverter unit shall allow for connected emergency fixture(s) to be normally on, normally off, switched or dimmed without affecting lamp operation during a power failure. Upon utility power loss, the inverter unit shall deliver 100% of its rated output to the emergency fixtures regardless of the local switch or dimmer position, and shall provide power to emergency fixtures at distances of up to 250 feet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units plumb and level.
- B. Aim directional lampheads to illuminate the path of egress.
- C. Provide an unswitched source of power to the emergency ballast from the same circuit that powers the fixture the ballast is installed in.
- D. Provide connection from each exit sign to fire alarm system for flashing feature.

3.2 FIELD QUALITY CONTROL

- A. Tests: Perform tests listed below according to manufacturer's written instructions. Test unit functions, operations, and protective features. Adjust to ensure operation complies with Specifications. Perform tests required by NFPA 70, Articles 700 and 701. Perform tests on completion of unit installation and after building circuits have been energized. Provide instruments to permit accurate observation of tests. Include the following tests:
 - 1. Simulate power outage: Verify proper operation of each individual emergency power supply.
 - 2. Verify emergency supply duration.
 - 3. Verify operation of remote test switches.
 - 4. Provide reports for load test conducted on individual batteries.
- B. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

3.3 ADJUSTING

- A. Aim lamp on wall-mounted emergency lighting units to obtain the following illumination of egress pathway:
 - 1. An average of 1 foot-candle.
 - 2. A minimum at any point of 0.1 foot-candle measured along the path of egress at floor level.
 - 3. Maximum-to-minimum illumination uniformity ratio of 40 to 1 shall not be exceeded.

- B. Test emergency lighting equipment in accordance with the manufacturer's instructions and NECA/IESNA 500.

3.4 CLEANING

- A. On completion of installation, inspect unit components. Remove paint splatters and other spots, dirt, and debris. Touch up scratches and abrasions in finish to match original finish. Clean unit internally using methods and materials recommended by manufacturer.

3.5 DEMONSTRATION

- A. Walk Contracting Officer through the emergency lighting system. Note how to maintain, test and troubleshoot all units. Provide maintenance schedule for NFPA required testing and note locations of remote test switches, and which units have self-diagnostic features.

END OF SECTION 26 52 00

SECTION 26 56 00
EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 WORK INCLUDED

- A. Exterior Luminaires and Accessories.
- B. Lamps.
- C. Drivers.

1.2 RELATED WORK

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements, and Section 26 05 00 – Common Work Results for Electrical.
- B. Division 09 – Finishes: Painting.
- C. Section 26 51 00 - Interior Lighting.
- D. Section 26 52 00 - Emergency Lighting.

1.3 REFERENCES

- A. ASTM D635 - Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position.

1.4 SUBMITTALS

- A. Product Data: Submit the following:
 - 1. Luminaires: Include manufacturer's product data sheets and/or shop drawings including outline drawings showing support points, weights, and accessory information for each luminaire type.

1.5 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of all lighting fixtures and accessories on the project record drawings.

B. Operation and Maintenance Manuals:

1. Provide recommended luminaire cleaning and re-lamping schedule. If any luminaire lenses require special lubricants for cleaning, include this in the schedule.
2. Provide detailed bill of materials for all items purchased in this section including distributor's contact name, phone number and pertinent information.
3. Provide luminaire manufacturer's installation instructions.
4. Include any specific warranty information provided by the manufacturer for luminaires, lamps and ballasts.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site, store and protect under provisions of Division 01.

1.7 EXTRA STOCK

- A. Provide spare parts under provisions of Division 01.
- B. Lenses: Three percent of quantity furnished, minimum of one of each size and type.
- C. Ballasts: One of each size and type installed.

PART 2 - PRODUCTS

2.1 EXTERIOR LUMINAIRES AND ACCESSORIES

- A. Luminaires: Provide UL listed luminaires as scheduled on the drawings or as approved equal.
- B. Listing: Luminaires shall be listed for use in the environment in which they are installed. For example, luminaires installed in return air plenums, direct contact with insulation, or in hazardous, wet, damp, or corrosive locations shall be UL listed for such application.
- C. Accessories: Provide all mounting kits, supports, interconnecting wiring, power supplies, trim kits, gaskets, etc. for a complete installation.

2.2 LAMPS

- A. Provide lamps for luminaires in accordance with Specification Section 26 51 00.

2.3 DRIVERS

- A. Provide drivers for luminaires in accordance with Specification Section 26 51 00.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install lamps in luminaires and lampholders.
- B. Unless otherwise noted on Plans, provide ballast integral to luminaires, pre-wired and installed at the factory, suitable for use with the selected lamp.
- C. Support surface-mounted luminaires directly from building structure.
- D. LED Power Supplies: Install power supplies to be readily accessible. Where power supplies are installed outdoors, provide UL listed enclosures rated to –20F.

3.2 RELAMPING

- A. Relamp luminaires which have failed lamps at completion of Work.

3.3 ADJUSTING AND CLEANING

- A. Align luminaires and clean lenses and diffusers at completion of Work. Clean paint splatters, dirt, and debris from installed luminaires.
- B. Touch up luminaire at completion of work.

END OF SECTION 26 56 00

SECTION 28 31 00

FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Contractor designed and installed addressable fire alarm and smoke detection system. This is a performance type specification describing the minimum acceptable fire alarm system. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of NFPA 72 and ICC/ANSI A117.1. The fire alarm devices on the drawings are shown in suggested locations. The final locations of all devices shall be solely determined by the Contractor and shall be in accordance with NFPA 72 and ICC/ANSI A117.1.

1.2 RELATED SECTIONS

- A. Division 08 - Door Hardware: Door Closers.
- B. Division 21 - Sprinkler System.
- C. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
- D. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- E. Section 26 05 53 – Identification for Electrical Systems.

1.3 REFERENCES

- A. NFPA 72 - National Fire Alarm Code.
- B. NFPA 101 - Life Safety Code.
- C. International Mechanical Code (IMC).
- D. Americans with Disabilities Act (ADA) and ADA Guidelines for Buildings and Facilities (ICC/ANSI A117.1).
- E. ANSI S3.41 - Audible Emergency Evacuation Signals.
- F. ANSI/ASME A17.1 - Safety Code for Elevators and Escalators.

1.4 REGULATORY REQUIREMENTS

- A. System: UL and FM listed.
- B. Conform to the requirements of UL 864.
- C. Conform to requirements of NFPA 101.
- D. Conform to requirements of ICC/ANSI A117.1.
- E. Install system in accordance with NFPA 72.
- F. Comply with requirements of ANSI A17.1.

1.5 SYSTEM DESCRIPTION

- A. Fire Alarm System: Contractor designed and installed, microprocessor controlled manual and automatic fire alarm system with individually addressable initiating devices. The Contractor shall design and install the fire alarm and smoke detection system in accordance with the requirements of these specifications, NFPA 72, NFPA 101, ANSI A17.1, and ICC/ANSI A117.1. The fire alarm devices on the drawings are shown in suggested locations. The Contractor shall modify these device locations as necessary to accommodate actual architectural, structural, or mechanical conditions, at no cost to the Contracting Officer.
- B. System Supervision: Provide electrically-supervised class B, addressable fire alarm system with fault tolerant supervised signaling line circuits and notification appliance circuits. Occurrence of single ground or open condition in signaling line circuit or notification appliance circuit places circuit in TROUBLE mode. Component or power supply failure places system in TROUBLE mode.
- C. Alarm Sequence of Operation: Actuation of manual fire alarm station or automatic initiating device causes system to enter ALARM, which includes the following operations:
 - 1. Sound and display local fire alarm notification appliances with ANSI S3.41 compliant temporal signal and synchronized flash.
 - 2. Transmit alarm signal to activate the digital alarm communicator.
 - 3. Indicate location and address of device in alarm on fire alarm control panel and on remote annunciator panel.
 - 4. Record the time, date and location of the alarm in the fire alarm panels' accessible history database.
 - 5. Transmit signals to building elevator control panel to initiate return to main floor or alternate floor in accordance with Rule 211.3b of ANSI/ASME A17.1.
 - 6. Transmit signal to shut down power to elevator in accordance with Rule 102.2 of ANSI/ASME A17.1. Upon activation of the heat detector used for elevator power shutdown, the system shall delay activation of the power shunt trip. Per section A.6.15.4.4 of NFPA 72, the delay shall be the time that it takes the elevator cab to travel from the top of the hoistway to the lowest recall level.

- D. Alarm Reset: Key-accessible RESET function resets alarm system out of ALARM if alarm has cleared.
- E. Trouble Sequence of Operation: System trouble, including grounding or open circuit of signaling line or notification appliance circuits, or power or system failure causes system to enter TROUBLE mode, including the following operations:
 - 1. Activate visual and audible trouble alarm by device at the fire alarm panel.
 - 2. Activate visual and audible trouble alarm by device at annunciator panel.
 - 3. Manual ACKNOWLEDGE function at control panel silences audible trouble alarm; visual alarm is displayed until initiating trouble is cleared.
 - 4. Record the time, date and location of the trouble condition in the panel's accessible history database.
 - 5. Transmit alarm signal to activate the digital alarm communicator.
- F. Drill Sequence of Operation: Manual DRILL function causes ALARM mode operation to sound and display local fire alarm notification appliances.
- G. Sprinkler System Water Flow Sequence of Operation: Water flow in sprinkler system shall cause the fire alarm control panel to enter the alarm state.
- H. Sprinkler System Valve Tamper Sequence of Operation: Activation of sprinkler valve tamper switch shall cause the fire alarm control panel to display a supervisory trouble indicator.
- I. Lamp Test: Manual LAMP TEST function causes each indicator lamp/LED at the fire alarm control panel and the annunciator panel to illuminate.
- J. The system shall be 100% field programmable for additions and deletions, and shall be capable of being expanded and field programmed at any time from the fire alarm control panel with a plug-in programmer without returning the devices or operating system to the factory for program change. System software and training shall be provided to the Contracting Officer as part of this contract.
- K. The fire alarm control panel shall report and identify the failure of any device connected to the system, a device removed from a signaling line or notification appliance circuit, or a transmitting device component failure while all other line devices on the channel shall continue to function. The control panel shall report failures by specific channel and address number and permanently record the event including time and date on the system database.
- L. Addressable control relays connected to the system shall be continuously monitored for proper state and position of contacts. Incorrect positions shall be automatically corrected by command from the control panel. If control relay fails to respond to the corrective command; the trouble signal shall sound, and the panel shall identify and permanently record the location of the fault. The control panel shall also monitor addressable control relays for proper state (position) after the system has commanded the relay to operate. Failure of the control relay to operate (change state) shall cause the panel to generate a trouble signal, identify and permanently record the location of the fault.

1.6 QUALIFICATIONS

- A. The installation of the system shall conform to the State of Alaska requirements and be supervised by a representative with a current State Fire Alarm License.
- B. Manufacturer: Company specializing in addressable smoke detection and fire alarm systems with five years documented experience.
- C. System Supplier: Factory trained to provide the submitted fire alarm system.
- D. Installer: Installation of the system shall be 100% field checked by a factory trained and authorized NICET Level III technician certified in the Fire Alarm System Program. The actual supervising technician must be approved prior to start of work.
- E. System Certifier: Company specializing in smoke detection and fire alarm systems certified by UL as an agency with the authority to provide a "Certificated Alarm System".

1.7 SUBMITTALS

- A. Submit product data under the provisions of Division 01.
- B. Submit manufacturer's installation instructions.
- C. Submit shop drawings prepared and signed by a NICET Level III technician certified in fire alarm systems under the provisions of Division 01. Shop drawings shall have the following requirements:
 - 1. The Shop Drawings shall be reproduced electronically from a Master Copy supplied in digital format. Electronic copy of the Contract Drawings will be available at no charge to use as base plan for generation of electronic submittal. Shop Drawings shall be printed at Contract Drawing size and scale of floor plans on Shop Drawings shall match Contract Drawings.
 - 2. All text on the drawings shall be legible without magnification when the shop drawings are reduced to 11" x 17".
 - 3. Provide minimum 1/4" scale floor plans with all new fire alarm control and auxiliary panels, field devices, raceway and conductor routing, quantities and connection requirements for every component.
 - 4. Provide point-to-point system wiring diagrams showing interconnection of all devices.
 - 5. Provide a riser diagram showing all devices on each NAC, SLC, and auxiliary circuit connected to the fire alarm control panel. Individual device addresses on riser diagram are not required for initial shop drawing submittal but shall be provided on the as-built drawings.
 - 6. Provide calculations to support battery size selection. Provide voltage drop calculations for each SLC and NAC circuit. Show the voltage drop at the furthest notification appliance from the control panel. Show all formulas and acceptable limits for all calculations. All calculations shall be shown on the shop drawings.

- D. Submit shop drawings and product data to the local Fire Marshal for review and approval. All shop drawings and product data shall be reviewed and approved by the authority having jurisdiction prior to procurement and installation of materials or devices for the system.
- E. Device Names: All device names that are displayed on the LCD text annunciators in the fire alarm panel shall be approved by the Contracting Officer. The Contractor shall request a list of approved room names for the facility prior to programming the fire alarm panel or any field devices.

1.8 PROJECT RECORD DRAWINGS

- A. Submit documents under the provisions of Division 01.
- B. Accurately indicate actual locations of notification appliances, initiating devices, fire alarm control panel, annunciators, etc.
- C. Provide Point to Point as-built wiring diagrams of the entire Life Safety System as installed. This shall include all connected devices with actual addresses and locations of all T-taps. All drawings shall be provided in AutoCAD .DWG format. Paper plots of each sheet shall also be provided.

1.9 OPERATION AND MAINTENANCE DATA

- A. Submit operating instructions and maintenance and repair procedures under the provisions of Division 01.
- B. Include manufacturer representative's letter stating the system is operational.
- C. Include an 11" x 17" set of the fire alarm system project record drawings.
- D. Include a completed copy of the NFPA 72 Inspection and Testing Form.

1.10 DEMONSTRATION AND TRAINING

- A. The Manufacturer's Representative shall be responsible for an on-site demonstration of the operation of the system and initial staff training.
- B. Under the provisions of Division 01 and Section 26 05 00, provide formal instruction in the operation, maintenance, and troubleshooting of all equipment, provided at the project site with manufacturer's representative with the Contracting Officer personnel.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site, store and protect, under provisions of Division 01.

1.12 EXTRA MATERIALS

- A. Provide spare parts under provisions of Division 01.
- B. Provide two keys of each type.
- C. Provide four addressable smoke detectors.
- D. Provide two 135°F addressable heat detectors.
- E. Provide one fire alarm horn/strobe.
- F. Provide two fire alarm strobe lights.

1.13 WARRANTY

- A. The Contractor shall be able to provide initial contact on warranty service and/or service contract requests from their principal location within eight (8) hours of notification.

1.14 MAINTENANCE CONTRACT

- A. As part of this project, include the UL required maintenance of the fire alarm system for one year from the date of substantial completion for the project as required to maintain the system as a UL Certificated Alarm System. At the end of one year, the Contracting Officer shall have the option of extending or canceling the maintenance of the system to maintain the UL certification.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Simplex
- B. Edwards Systems Technology (EST).
- C. Gamewell-FCI.
- D. Honeywell.
- E. Johnson Controls.
- F. Notifier.
- G. Siemens.
- H. Substitutions: Under provisions of Division 01.

2.2 FIRE ALARM AND SMOKE DETECTION CONTROL PANEL

- A. Control Panel: Microprocessor controlled, addressable panel with modular construction and flush wall-mounted enclosure.
- B. Power Supply: Adequate to serve control panel modules, initiating devices, notification appliances, remote annunciators, door holders, relays, etc. plus 25 percent spare capacity to allow for future system load growth. Include battery-operated emergency power supply with capacity for operating system in standby mode for 24 hours followed by alarm mode for 5 minutes. Size battery capacity to allow for a 25 percent growth of the system load while complying with the above requirements.
- C. Signaling Line Circuits: Class B, Style 4, signaling line circuit with capacity sufficient for all initiating devices connected to the circuit plus 25 percent spare capacity to allow for future load growth.
- D. Notification Appliance Circuits: Class B, Style Y, notification appliance circuit complying with ANSI S3.41 with capacity sufficient for all notification appliances connected to the circuit plus 25 percent spare capacity to allow for future load growth.
- E. Control Relays: Provide sufficient addressable control relays to provide accessory functions specified and required by the drawings.
- F. Provide TROUBLE ACKNOWLEDGE, DRILL, and ALARM SILENCE switch.

2.3 INITIATING DEVICES

- A. Manual Station: Semi-flush mounted, single action addressable manual station.
- B. Ceiling Mounted Smoke Detector: Addressable, NFPA 72, photoelectric type with adjustable sensitivity, plug-in base, and visual indication of detector actuation, suitable for mounting on 4-inch outlet box.
- C. Heat Detector: Addressable combination rate-of-rise and fixed temperature, rated 135° F, and temperature rate of rise of 15° F. Provide fixed temperature devices rated 200° F where indicated. Heat detectors in the elevator machine rooms shall have both a lower temperature rating and a higher sensitivity as compared to the sprinkler head in the room.
- D. Provide any specialized tools or interface equipment as required to program the addressable devices (i.e. Siemens "Device Programming Unit"). Turn over one of each type of tool to Contracting Officer at completion of project.

2.4 INTELLIGENT MODULES

- A. A control relay/transponder shall be installed where building services (i.e. fan shutdown, door holder or release, etc.) are to be automatically controlled by the fire alarm system during a fire emergency. The control relay shall be of a type that only consumes power momentarily while transferring from the deenergized to the energized state or back again. The command to change

state shall come from the control panel in accordance with the system program. The control relay shall be condition (deenergized or energized) supervised, and its condition shall be confirmed and corrected, if necessary, during each polling cycle. The control relay/transponder shall be capable of operating on the same communication channel with initiating devices/transponders so that it can be located within 3 feet of the building service device it is controlling as required by NFPA 101-Life Safety Code while its integrity is being monitored from the control panel. The address code of the control relay transponder shall be field selectable and changeable in the same manner as for other transponders. The control relay/transponder type code shall be factory preset and not be field changeable.

2.5 LINE FAULT ISOLATOR

- A. A line fault isolator shall be installed to protect a signaling line circuit from being completely disabled by a short circuit fault. Each signaling line circuit shall have a line fault isolator as every tenth device on the circuit. Only the two line fault isolators with the short circuit fault between them shall respond to the fault condition. When sensing the short the line fault isolators shall disconnect the part of the signaling line circuit between them that includes the short conditioning each remaining part of the circuit to continue to function as a Class B signaling line circuit. Only the transponders located between the 2 line fault isolators shall be disabled, and their failure to respond to the system polling shall be reported as a wiring trouble condition and a list of the addresses of the disabled transponders shall be displayed and recorded at the control panel.

2.6 NOTIFICATION APPLIANCES

- A. All appliances shall be U.L. Listed for Fire Protective Service.
- B. All appliances shall be of the same manufacturer as the Fire Alarm Control Panel specified to assure absolute compatibility between the appliances and the control panels, and to assure that the application of the appliances is done in accordance with the single manufacturer's instructions.
- C. Any appliances that do not meet the above requirements, and are submitted for use must show written proof of their compatibility for the purposes intended. Such proof shall be in the form of documentation from all manufacturers that clearly states that their equipment (as submitted) is 100% compatible with each other for the purposes intended.
- D. Fire Alarm Bells: electric vibrating, 10 inch bell with operating mechanism behind dome. Sound Rating: 81dB at 10 feet. Provide weatherproof back box and protective grid on exterior bells.
- E. Fire Alarm Strobe Lights: NFPA 72 compliant, surface wall ceiling mounted, self-synchronizing, xenon, fire alarm strobe lamp and flasher with flash rate of one flash per second, complying with the requirements of ICC/ANSI A117.1. Provide red lettered FIRE on clear lens. The strobe shall be field-selectable to provide 15, 30 75, or 110 candela synchronized flash outputs. The settings of all strobes shall be determined by the Contractor during the shop drawing process.

- F. Fire Alarm Horn: ANSI S3.41 and NFPA 72 compliant, flush[surface mounted fire alarm horn with adjustable sound output level. Sound Rating: 87 dBA (reverberant) at 10 feet on the “high” setting and 82 dBA (reverberant) at 10 feet on the “low” setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in every occupied space within the building. Provide integral fire alarm strobe light as specified above where indicated on the drawings.
- G. Fire Alarm Chime and Strobe: ANSI S3.41 and NFPA 72 compliant, flush surface mounted fire alarm chime with adjustable sound output level. Sound Rating: 70 dBA (reverberant) at 10 feet on the maximum volume setting and 64 dBA (reverberant) at 10 feet on the minimum volume setting. Provide minimum sound pressure level of 15 dBA above the average ambient sound level in areas where mini-horns are used. Provide integral fire alarm strobe light as specified above.
- H. Digital Alarm Communicator: Provide an electrically supervised, U.L. 864 listed digital alarm communicator to be installed in the fire alarm control cabinet. Communicator shall be capable of transmitting an alarm condition, a trouble condition, a supervisory alarm or a sprinkler system water flow alarm over telephone lines to a central station receiver. Communicator shall be listed for use with the installed system.

2.7 AUXILIARY DEVICES

- A. NAC Booster Power Supplies:
 - 1. Existing Power Supplies: New notification appliances may be connected to existing booster power supplies if the unit and batteries have sufficient capacity.
 - 2. Power supply quantity, rating and battery size shall be determined by the Contractor. All locations of new power supplies shall be approved by the Contracting Officer prior to shop drawing submittal. Provide one or more dedicated circuits for all new power supplies. Each circuit shall have a handle lock on the breaker.
 - 3. Smoke Detection: Provide a smoke detector to protect each NAC booster power supply in accordance with NFPA 72 requirements. Note that because the quantity and locations of NAC boosters are determined by the Contractor, these smoke detectors are not shown on the Contract Drawings but they shall be provided at no additional cost to the Government.

2.8 FIRE ALARM WIRE AND CABLE

- A. Fire Alarm System Power Branch Circuits: Building wire as specified in Section 26 05 19.
- B. Notification Appliance Circuits: Minimum #12 AWG copper building wire, as specified in Section 26 05 19.
- C. Initiating and Signaling Line Circuits: Twisted, shielded or unshielded fire alarm cable as recommended by the fire alarm system manufacturer. Minimum size #16 AWG.

2.9 FIRE ALARM SYSTEM MAP

- A. On wall beside each fire alarm panel and text annunciator, provide a system map under clear 1/8" plexiglass with black metal frame permanently screwed to the wall with 4 screws around the perimeter of the map.
- B. Map to denote locations of all panels, annunciator, and device address and room numbers that correlate with text display on panel to locate system event.
- C. Orientate each map consistent with location the map is installed. Provide call denoting "YOU ARE HERE" at the installation point for each map.
- D. The map shall be color-coded for clarity.
- E. The final layout to be approved prior to final printing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install the fire alarm system in accordance with the manufacturer's instructions.
- B. Install manual station with operating handle not less than 42 inches and not more than 48 inches above finished floor. Install audible notification appliances with top of device not less than 90 inches above finished floor, and not less than 6 inches below finished ceiling. Install visual notification appliances such that the entire lens is not less than 80 inches and not greater than 96 inches above finished floor.
- C. Install all smoke detectors a minimum of three feet from any air supply, return, or exhaust diffuser and a minimum of one foot from any light fixture.
- D. Install all fire alarm system wiring in a dedicated conduit or wiring system separate from any other system wiring. Provide minimum 8 inch wire tails at each device box and 50 inch wire tails at the fire alarm control panel.
- E. Make conduit and wiring connections to door release devices, sprinkler water flow switches, sprinkler valve tamper switches, elevator controllers and other items as shown on the drawings or required by NFPA 72. Note that the sprinkler system is a design build system and not all valve tamper switches and flow switches may be shown on the drawings. The Contractor is responsible to field coordinate all tamper and flow switch locations and connect all switches to the fire alarm system.
- F. In elevator shafts and/or machine rooms, install heat detectors within two feet of each sprinkler head. The temperature rating of the heat detector shall be lower than that of the associated sprinkler head.
- G. The Contractor is responsible to field coordinate the final location of all initiating devices and notification appliances to comply with the requirements of NFPA 72. Any initiating devices or

notification appliances that are not installed in accordance with NFPA 72 shall be relocated to comply with the requirements of NFPA 72 at no cost to the Government.

- H. Detectors shall not be installed until after the construction cleanup of all trades is complete and final. Protective dust covers shall be installed on all detectors prior to final clean-up. Detectors that have been installed without dust covers prior to final clean-up shall be replaced at no cost to the Government.
- I. Where surface mounted devices are used, the Contractor shall install the manufacturer's approved surface mounting boxes and decorative skirts. The use of standard outlet boxes as specified in Section 28 05 28.33 is not acceptable.
- J. Provide two dedicated telephone lines for connection of the digital alarm communicator.
- K. Coordinate with Contracting Officer to arrange a 24 hour monitoring service for digital alarm communicator that meets the requirements of NFPA 72 and the Authority Having Jurisdiction. Program the system to identify each device with the submitted and approved designation in the LCD annunciators on the control panel and remote text annunciator.

3.2 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.
- B. Test in accordance with NFPA 72 and local fire department requirements. Provide a completed NFPA 72 Inspection and Testing Form and a copy of the Certificated Alarm System paperwork for inclusion in the Operation and Maintenance manual at the completion of testing and commissioning the fire alarm system.
- C. Provide all equipment, devices and manpower as necessary to test each and every device in the fire alarm system both for function and supervision. Demonstrate that all devices connected to the system function properly.
- D. The facility will not be accepted as substantially complete until the fire alarm system has been tested and demonstrated to the Contracting Officer authorized representative as 100 percent complete and fully functional, a completed NFPA 72 Inspection and Testing form is submitted.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Provide manufacturer's field services under provisions of Division 01.
- B. Include services of a certified technician to supervise installation, adjustments, final connections, programming and system testing.

3.4 FIRE ALARM SYSTEM IDENTIFICATION

- A. Wire and Cable: Provide fire alarm unit conductors with color coded insulation, or use color coded tape at each conductor termination and in each junction box as follows:

1. Power Branch Circuit Conductors: Black, red, white.
 2. Initiating Device Circuit: Black, red.
 3. Detector Power Supply: Violet, brown.
 4. Notification Appliance Circuit: Blue (positive), white (negative).
- B. Identify all circuit conductors at all terminal and junction boxes per NEC 760.30. Use the circuit designations (i.e. "NAC 1", "SLC 1", etc.), as indicated on the shop drawings.
- C. Fire Alarm Device Labels:
1. Install machine-printed device address labels on all addressable devices, including smoke/heat detectors, control relays, monitor modules, etc. Unless otherwise noted, in public spaces where devices are mounted below +80" on walls, install label on inside cover of device. At all other locations, install label on exterior cover of device. Device labels shall show the unique device address corresponding to the text annunciator description. For smoke detectors, the label shall be affixed to the base and not to the detector itself.
 2. Provide label on each remote test station indicating description and location of device being tested.
 3. Provide label on telephone conductors at each end denoting FACP lines for use with the digital alarm communicator transmitter (DACT).
- D. The circuit disconnecting means for the fire alarm control panel circuit, remote power booster supply, or other control equipment circuits shall have a painted red handle and handle lock. The circuit(s) shall be labeled "Fire Alarm Circuit". The circuit assignment and panel location shall be permanently identified on all fire alarm control equipment.

END OF SECTION 28 31 00

SECTION 31 20 00

EARTH MOVING

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. Excavating and filling for rough grading the Site.
 - 2. Preparing subgrades for elevator pit.
 - 3. Excavating and backfilling for buildings and structures.
 - 4. Excavating and backfilling trenches for utilities and pits for buried utility structures.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

- I. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- J. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct preexcavation conference at Project site.
 - 1. Review methods and procedures related to earthmoving, including, but not limited to, the following:
 - a. Personnel and equipment needed to make progress and avoid delays.
 - b. Coordination of Work with utility locator service.
 - c. Extent of trenching by hand or with air spade.
 - d. Field quality control.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Material Test Reports: For each borrow soil material proposed for fill and backfill as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to ASTM D 698.

1.6 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Contracting Officer and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Contracting Officer or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures specified in are in place.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups SW, SP, SM, GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Sand: ASTM C 33/C 33M; fine aggregate.

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Telephone and other communications.
 - 4. Blue: Water systems.
 - 5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - 2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 12 inches outside of concrete forms at footings.
 - b. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - c. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - d. 6 inches beneath bottom of concrete slabs-on-grade.
 - e. 6 inches beneath pipe in trenches and 24 inches wider than pipe wide.

3.4 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.5 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
 - 1. Clearance: 12 inches each side of pipe or conduit.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
 - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
 - 2. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.6 SUBGRADE INSPECTION

- A. Notify Contracting Officer when excavations have reached required subgrade.
- B. If Contracting Officer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.
 - 1. Completely proof-roll subgrade in one direction. Limit vehicle speed to 3 mph.
 - 2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Contracting Officer, and replace with compacted backfill or fill as directed.

- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Contracting Officer, without additional compensation.

3.7 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Contracting Officer.
 - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Contracting Officer.

3.8 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.9 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for Record Documents.
 - 3. Testing and inspecting underground utilities.
 - 4. Removing concrete formwork.
 - 5. Removing trash and debris.
 - 6. Removing temporary shoring, bracing, and sheeting.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.10 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill voids with satisfactory soil while removing shoring and bracing.
- D. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe or conduit.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Final Backfill:
 1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- F. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.11 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
 2. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.12 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to match existing site.
 1. Provide a smooth transition between adjacent existing grades and new grades.
 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.13 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections. Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - 1. Determine that fill material classification and maximum lift thickness comply with requirements.
 - 2. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Contracting Officer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2937, and ASTM D 6938, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Elevator Put Areas: At subgrade and at each compacted fill and backfill layer, at least one test in pit area.
 - 2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length but no fewer than two tests.
 - 3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.14 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Contracting Officer; reshape and recompact.

- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

- 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.15 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Government's property.
- B. Transport surplus satisfactory soil to designated storage areas on Government's property. Stockpile or spread soil as directed by Contracting Officer.
 - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Government's property.

END OF SECTION 31 20 00

SECTION 33 71 73

ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Arrangement with Utility Company for permanent electric service including payment of Utility Company charges for service.
- B. Existing Underground service entrance.

1.2 RELATED SECTIONS

- A. The Work under this section is subject to requirements of the Contract Documents including the General Conditions, Supplementary Conditions, and sections under Division 01 General Requirements and Section 26 05 00 – Common Work Results for Electrical.
- B. Section 26 05 26 – Grounding and Bonding for Electrical System.
- C. Section 26 05 33 – Raceway and Boxes for Electrical Systems.
- D. Section 26 05 53 – Identifications for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. NEMA 250 – 2003 Enclosures for Electrical Equipment (1000 Volts Maximum).
- B. UL 50 – 1995 Enclosures for Electrical Equipment.
- C. UL 414 – 1999 Standard for Meter Sockets.

1.4 SYSTEM DESCRIPTION

- A. System Voltage: 120/208volts, three phase, four-wire, 60 Hertz.
- B. Service Entrance: Underground.

1.5 SUBMITTALS

- A. Product Data: Submit product data for all components provided, showing electrical characteristics, material, finishes, and dimensions. Each catalog sheet should be clearly marked to indicate exact part number provided, including all options and accessories.

- B. Shop Drawings: Submit shop drawings and manufacturer's literature for self-contained meter base with circuit breaker disconnecting means.

1.6 CLOSEOUT SUBMITTALS

- A. Project Record Drawings: Indicate actual locations and mounting heights of service entrance equipment on the project record drawings.
- B. Operation and Maintenance Manuals: Submit shop drawings and manufacturer's literatures for all equipment, housing, cable, etc. proposed for used on this project. Shop drawings including a complete list of equipment, material, and containing complete wiring and schematic diagrams and other details required to demonstrate that the system has been coordinated and will function properly as a system.

1.7 QUALITY ASSURANCE

- A. Utility Company: City of Seward
- B. Install service entrance in accordance with Utility Company's rules and regulations.

PART 2 - PRODUCTS

2.1 METERING EQUIPMENT

- A. Meter: Furnished and installed by the Utility Company.
- B. Transformer Rated Meter Base: NEMA 3R stainless steel, 13-terminal, transformer rated 20 amperes, 600 volts with mounting provisions to accommodate a covered test switch with test switch cover sealing provisions. The test switch mounting provisions shall accept a 10 pole covered test switch with a base dimension of 9.5 inches in width and a depth (the dimension from the rear edge of the test switch base to the top of the cover sealing stud) of no less than 3.375 inches. The lower cover of the meter socket shall seat fully with a covered test switch in place. Meet requirements of NEMA standards for watt-hour meter sockets-NEMA EI17-1978 (similar to EUSERC Drawing No. 339). The utility company will furnish and install the test switch and CT wiring. 13-jaw is for three phase.
- C. Current Transformer Cabinet: NEMA 3R stainless steel UL 414 listed, minimum size as required by the local utility. All current transformer cabinets and compartments shall have hinged front cover access to the current transformers. The hinged front cover shall be lockable and shall accept a padlock with a shackle diameter of not less than 5/16 inch. Current transformer cabinets for services from 201 Amperes to 800 Amperes shall have 1/4 x 20 mounting studs on the enclosure body spaced to accept a current transformer mounting base. .
- D. All removable covers for compartments containing un-metered conductors shall be sealable or lockable with sealable latches, stud and wing-nuts, sealing screws, or slot and tab devices. All top cover panels, side cover panels and rear cover panels providing access to un-metered conductors shall be secured in place with devices that cannot be loosened from the outside,

screws or bolts requiring special tools for installation or removal are not acceptable alternates. No removable panel or cover requiring sealing or locking shall be located behind other panels, covers or doors except for rain-tight enclosures. Hinged cover panels shall be lockable on the side opposite the hinges. Hinged panel covers shall accept a padlock with a shackle diameter of not less than 5/16 inch. Stud and wing-nut sealing assemblies shall consist of a 1/4 inch x 20 (minimum) stud and associated wing-nut, each drilled 0.0635 inch (minimum) for sealing purposes. The stud shall be securely attached so as to not loosen or back out when being fastened. Sealing screws shall be drilled 0.0635 inch (minimum) for sealing purposes. All securing screws for removable panel covers shall be captive.

- E. Current Transformer: Provided by Utility.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Make arrangements with Utility Company to obtain permanent electric service to the Project.
- B. Underground: Utility Company will disconnect existing service lateral conductors from existing service entrance conductors and reconnect existing service lateral conductors to new service entrance conductors.
- C. Spray all exposed conductor sections and termination lugs with Scotch #1602 Ivi-Spray or approved equal red electrical sealer.
- D. Meter sockets shall be installed with the centerline of the socket opening no more than 72 inches and no less than 60 inches above finished grade. The meter socket shall be installed with a minimum 10 inches of side clearance to each side of the socket. On current transformer rated meter sockets, the conduit connecting the meter socket and the current transformer cabinet shall be rigid steel or IMC and have a minimum diameter of 1 inch, shall not be longer than 50 feet with less than 180° in total bends, shall have no access points (junction boxes, condulets, etc.), and shall connect to the meter socket at a factory supplied knockout located below the test switch mounting provisions.
- E. Wall mounted current transformer enclosures shall be mounted with the top of the cabinet no more than 90 inches above grade and the bottom of the cabinet no less than 16 inches above grade.
- F. Current transformer cabinets shall not be used as a junction point to service other metered services or as a splicing chamber.
- G. All service entrance equipment shall have signage for arc hazard installed. The marking shall be located to be clearly visible to qualified personnel before examination, adjustment, servicing or maintenance of the equipment. At a minimum the signage shall state the following:

Warning

Arc Flash and Shock Hazard

Appropriate PPE Required

END OF SECTION 33 71 73