



ISSUED FOR CONSTRUCTION

December 2012

Specifications

TSA Portland, ME Succeeding Lease & Expansion

Portland, Maine

5510016

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SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and conditions of the construction contract, including but not limited to Contract Clauses, and the Special Conditions listed below, apply to work of this section.

1. List of Specifications: Refer to Table of Contents
2. Schedule of Drawings:

DRAWING NO.	SHEET SEQUENCE	DRAWING TITLE
G 0 01	01 of 23	Title Sheet
LS 1 01	02 of 23	Life Safety Plan
AD 1 01	03 of 23	Demolition Floor Plan
AD 1 02	04 of 23	Demolition Reflected Ceiling Plan
AE 1 01	05 of 23	Floor Plan
AE 1 02	06 of 23	Reflected Ceiling Plan
AE 4 01	07 of 23	Enlarged Plans and Details
AE 6 01	08 of 23	Door and Finish Schedules
FD 1 01	09 of 23	Fire Alarm Demolition Plan
FA 1 01	10 of 23	Fire Alarm Plan
P 0 01	11 of 23	Plumbing Details, Legend, & Schedules
P 1 01	12 of 23	Plumbing Floor Plans
M 0 01	13 of 23	Mechanical Legend & General Notes
M 1 01	14 of 23	Mechanical Floor Plan & Schedules
M 5 01	15 of 23	Mechanical Details
E 0 01	16 of 23	Legend Abbreviations & General Notes
ED 1 01	17 of 23	Demolition Floor Plans
ED 1 02	18 of 23	Demolition Lighting Plan
EP 1 01	19 of 23	Electrical Power Floor Plan
EL 1 01	20 of 23	Electrical Lighting Plan
EY 1 01	21 of 23	Electrical Systems Floor Plan
EY 1 02	22 of 23	Electrical Security Floor Plan
E 6 51	23 of 23	One Line Diagram

1.2 PROJECT/WORK IDENTIFICATION

A. Project Name and Location:

TSA Portland, ME Succeeding Lease & Expansion
 Portland International Airport
 1001 Westbrook Street
 Portland, Maine

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B. Owner: The Portland International Jetport is owned by the City of Portland, ME.

C. Architect:
AMEC Environment & Infrastructure, Inc.
511 Congress Street
Portland, Maine 04101

D. Contracting Personnel and Government references for this project are:

Contracting Officer (CO):
Arthur Laferriere
Project Engineer
Portland International Jetport
1001 Westbrook Street
Portland, ME 04102

Government and Owner: All references to "Government" and "Owner" refer to the City of Portland, Maine.

All project communications will be through this individual or their designated representatives.

Contracting Officer's Technical Representative (COTR)
Thomas Woods
U. S. General Services Administration
E. S. Muskie Federal Building, Room 207C
40 Western Avenue
Augusta, ME 04330

E. Contract documents indicate the work of contract, and related requirements and conditions that have an impact on the project. Related requirements and conditions that are indicated on the contract documents include, but are not necessarily limited to, the following:

1. Existing site conditions and restrictions.
2. Items for which separate price is required.
3. Requirements for occupancy by Government prior to completion of work of contract.

F. Summary by References: Work of Contract can be summarized by reference to the conditions of the contract, specification sections as listed in the "Table of Contents" bound herewith, drawings as listed in "Schedule of Drawings" bound herewith, addenda and modifications to the contract documents issued subsequent to the initial printing of this project manual, and including but not necessarily limited to printed matter referenced by any of these.

G. Abbreviated Written Summary: Briefly, and without force and effect upon the Contract Documents, work of the Contract can be summarized as follows:

1. The United States GSA leases space in the Portland International Jetport, which is leased to the TSA. Work includes the renovations and expansion to the existing 2nd floor TSA space in the Portland International Airport. Includes removals, new wall construction, finishes and the associated mechanical, plumbing and electrical work.
2. The project has the following Bid Options:

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- a. Bid Option #1: Remove and replace additional carpet and rubber base as indicated on the Drawing AE 6 01 Door and Finish Schedules.
- b. Bid Option #2: Break Room 101 – Infill entire opening with metal stud wall with 5/8-inch Type X gypsum wallboard on either side. New wall to match existing thickness for an unblemished appearance on both sides. Finish wall on both sides to match existing adjacent finishes. Final wall assembly to achieve a one hour rating

1.3 CONTRACTOR USE OF PREMISES

- A. General: The Contractor shall limit his use of the premises to the work indicated, so as to allow for Government occupancy and use and use by the general public.
 1. Use of the Site: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction. See "Project Coordination" section.
 2. Contractor Use of the Existing Building: Maintain the existing building in a safe and weathertight condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period. See "Project Coordination" section.
 - a. Owner Occupancy: Allow for full Owner occupancy and use by the public.
 - b. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the public, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site. For use of existing sanitary facilities, see "Temporary Facilities" section.
 3. Use of Existing Elevators: See "Temporary Facilities" section.

1.4 GOVERNMENT OCCUPANCY

- A. Full Facility Occupancy: The Jetport will fully occupy the site and the existing building during the entire period of construction and remain fully functioning. Cooperate fully with the Government representative during construction operations to minimize conflicts and to facilitate Government usage. Perform the work so as not to interfere with the Government operations.

1.5 INSPECTION BY REGULATORY AUTHORITIES

- A. This project is subject to inspection by the following regulatory authorities:

OSHA
Portland International Jetport
Local and State Authorities
- B. Notify Contracting Officer when inspections take place. Decision as to action to be taken as a result of inspections by regulatory authorities will be made by the Contracting Officer.

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1.7 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally limited to be performed inside the existing building during business working hours Monday through Friday.
1. Hours for Work will be Limited to: 8:00 p.m. – 6:00 p.m., Monday through Friday.
 2. Contractor to review and get approval with the Contracting Officer for any work proposed to occur between 6:00 pm. and 8:00 a.m. and on holidays and weekends at least 14 days prior to commencement of such work.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner 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 one week in advance of proposed utility interruptions. Do not proceed with utility interruptions without Contracting Officer's written permission.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 33-division format and CSI/CSC's "MasterFormat" numbering system
1. Division 1: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
 2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
 3. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.9 MISCELLANEOUS AND GENERAL PROVISIONS

- A. New Work: Unless otherwise noted on drawings or specified, new work in extension of existing conditions shall correspond in all respects with that to which it connects, or to similar existing conditions, in materials, workmanship, and finish.

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B. Alterations to Existing Work:

1. Existing work shall be cut, drilled altered, removed, or temporarily removed and replaced as necessary for performance of work under the contract. Work that is replaced shall match similar existing work. Structural members shall not be cut or altered, except where noted on drawings, without authorization of the Contracting Officer. Work remaining in place which is damaged or defaced during this contract shall be restored to the condition existing at time of award of contract.
2. Discolored or unfinished surfaces exposed by removal of existing work and indicated to be the final exposed surfaces shall be refinished or the material shall be replaced as necessary to make contiguous work uniform and harmonious. Work out of alignment where exposed by removal of existing work shall be called to the Contracting Officer's attention. Necessary corrective work directed by the Contracting Officer will be subject to adjustment of the contract in accordance with "Differing Site Conditions" clause of the General Conditions.

C. Work Done by Others: This contractor shall cooperate and coordinate with other contractor's on the site.

D. Photographic Documentation

1. Complete existing conditions photographs shall be taken to document all existing conditions of the area of work as well as adjacent areas/materials.
2. Photographs of the area of work shall be taken daily. Photo documentation shall illustrate all areas of the work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION 011000

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
 - 1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with Continuation Sheets.
 - b. Submittals Schedule.
 - c. Contractor's Construction Schedule.
 - 2. Submit the Schedule of Values to Contracting Officer at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the Schedule of Values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Government's Project Number
 - d. Contractor's name and address.

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- e. Date of submittal.
2. Submit draft of AIA Document G703 or Contractor's approved equivalent Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
 - a. Related Specification Section or Division.
 - b. Description of the Work.
 - c. Name of subcontractor.
 - d. Name of manufacturer or fabricator.
 - e. Name of supplier.
 - f. Change Orders (numbers) that affect value.
 - g. Dollar value.
 - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
 - a. Differentiate between items stored on-site and items stored off-site. If specified, include evidence of insurance or bonded warehousing.
7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Contracting Officer and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

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- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 or Contractor's approved equivalent Continuation Sheets as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Contracting Officer will return incomplete applications without action.
1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Contracting Officer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of Values.
 3. Contractor's Construction Schedule (preliminary if not final).
 4. Products list.
 5. Schedule of unit prices.
 6. Submittals Schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Performance and payment bonds.
 15. Data needed to acquire Owner's insurance.

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16. Initial settlement survey and damage report if required.
- H. Application for Payment at Substantial Completion: After issuing the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
 2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims" or Contractor's approved equivalent.
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens" or Contractor's approved equivalent.
 6. AIA Document G707, "Consent of Surety to Final Payment" or Contractor's approved equivalent.
 7. Evidence that claims have been settled.
 8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.
 9. Final, liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. This section specifies general administrative procedures and performance required, including but not necessarily limited to, the following:
1. Coordination and meetings.
 2. Administrative/supervisory personnel.
 3. Limitations for use of site.
 4. Special reports.
 5. Tradespeople and workmanship standards.
 6. Inspections, tests and reports.
 7. General installation provisions.
 8. Overtime work, suspension of work
 9. Cutting and patching.
 10. Cleaning and protection.
 11. Environmental Protection.
 12. Work restrictions.

1.2 COORDINATION AND MEETINGS

- A. General: Prepare and distribute to each entity performing work at project site, a written memorandum of instructions on required coordination activities, including required notices, reports and attendance at meetings. Prepare similar memorandum for separate government contractors where interfacing of work is required.
- B. Coordination drawings: Refer to clause "Shop Drawings, Coordination Drawings, and Schedules," of "Contract Clauses," for general requirements.
1. Work by Separate Entities: Where work by separate entities requires off-site fabrication of products and materials which must be accurately interfaced and closely intermeshed to produce required results, prepare coordination drawings to indicate how work shown by separate shop drawings will be interfaced, intermeshed, and sequenced for installation. Comply with submittal requirements of "Submittals" section.
 2. Work installed without prior approval: Any work installed prior to a required approval of coordination drawings shall be at the Contractor's risk. Subsequent relocations required to avoid interferences shall be made without additional expense to the Government. In case interference develops, the Contracting Officer will decide which work shall be relocated, regardless of which was installed first.
- C. Coordination of Trades: Coordinate work of different trades so that interference between mechanical, electrical, architectural, and structural work, including existing services, will be avoided and within limits indicated the maximum practical space for operation, repair, removal, and testing of equipment is

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provided.

- D. Preconstruction Meeting: The Government will conduct a meeting to discuss administrative procedures with the contractor which will be scheduled to occur between the Contract Award and the Notice to Proceed.
- E. Weekly Coordination Meeting: In addition to specific coordination meetings for each major element of work, and regular project meetings for other purposes (as indicated elsewhere in contract documents), hold weekly general project coordination meetings at regularly scheduled times which are convenient for everyone involved. Request representation (at each meeting) by every entity currently involved in coordination or planning for work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of meetings and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
 - 1. Review work schedule including when work is being done in which rooms for the upcoming three weeks at this meeting. Coordinate with Government necessary staffing needs for this period.

1.3 ADMINISTRATIVE/SUPERVISORY PERSONNEL

- A. General: In addition to a General Superintendent and other administrative and supervisory personnel required for performance of the work, provide specific coordinating personnel as specified herein.
- B. Environmental Control Officer: The Contractor shall designate an "Environmental Control Officer" whose duties shall include the responsibility for enforcing the environmental protection provisions of these specifications including safety and health; the requirements of the Occupational Safety and Health Act; and other applicable Federal, state and local standards. As outlined in the applicable sections of this specification, submit for approval by the Contracting Officer the proposed security plan, housecleaning plan, demolition program, and safety and health plan. After approval by the Contracting Officer, the implementation and enforcement of these programs shall become the responsibility of the Environmental Control Officer. Any changes in the programs must be requested by the Contractor through the Environmental Control Officer for written concurrence by the Contracting Officer. NOTE: The duties of the Environmental Control Officer may be combined with the duties of another individual associated with this project who is also qualified to perform the duties of the Environmental Control Officer.
- C. Project Coordinator: Provide a Project Coordinator, who is experienced in administration and supervision of building construction including mechanical and electrical work, and who is hereby authorized to act as the general coordinator of interfaces between units of work. For purpose of this provision, "interface" is defined to include the scheduling and sequencing of work, sharing of access to work spaces, installations, protection of each other's work, cutting and patching, tolerances, cleaning, selections for compatibility, preparation of coordination drawings, inspections, tests, and temporary facilities and services. NOTE; The duties of the Project Coordinator may be combined with the duties of another individual associated with this project who is also qualified to perform the duties of Project Coordinator.
- D. Submittal of Staff Names, Duties: Within 15 days of contract date, submit a listing of Contractor's principal staff assignments and consultants, naming persons and listing their addresses and telephone numbers.

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1.4 LIMITATIONS FOR USE OF SITE

- A. General: In addition to site utilization limitations and requirements shown on drawings, and indicated by other contract documents, administer allocation of available space equitably among entities needing access and space, so as to produce best overall efficiency in performance of total work of project. Schedule deliveries so as to minimize space and time requirements for storage of materials and equipment on site.
 - a. See specification section "Summary of Work" for specific work hour limitations.
- B. Occupancy of Premises: With the exception of the spaces being renovated, the Building will be fully and publically occupied at all times during performance of work under the contract.
- C. Parking Facilities: Except as noted or specified, and except for one Contractor vehicle, there will be no parking available at site during normal working hours. The Contractor and his employees shall make their own arrangements for vehicle parking.
- D. Loading Dock Facilities: The Government will need to coordinate all use of the loading dock. Coordinate need to access dock with Contracting Officer and provide a minimum of 48 hour notice for any use.
- E. Materials on the Site: Unless otherwise noted or specified, materials and equipment that are removed and not reused under this contract become the property of the Contractor, and salvage value shall be reflected in the bid.
- F. Storage or Sale of Equipment on Site: Storage or sale of excess salvageable material on the site is not permitted. Remove from site.
- G. Areas abutting the project are suspect to significant security requirements. Provide Contracting Officer 7 days notification prior to any access to these areas including the Jetport passenger gate area. See Section 13200 for schedule documentation for added requirements

1.5 SPECIAL REPORTS

- A. General: Except as otherwise indicated, submit special reports to the Contracting Officer within one day of occurrence requiring special report, with copy to others affected by occurrence.
- B. Reporting Accidents: Refer to Section, "Governmental Safety Requirements," 013526.
- C. Reporting Unusual Events: When an event of unusual and significant nature occurs at site (examples: visit by news media; extraordinary weather phenomenon), prepare and submit a special report listing chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. When such events are known or predictable in advance, advise the Contracting Officer in advance at earliest possible date.

1.6 TRADESPERSONS AND WORKMANSHIP STANDARDS

- A. General: Instigate and maintain procedures to ensure that persons performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality-levels for

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workmanship in completed work. Remove and replace work which does not comply with workmanship standards as specified and as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.

- B. Availability of Tradespersons: At each progress or coordination meeting, review availability of tradespersons and projected needs to accomplish work as scheduled. Require each entity employing personnel to report on events which might affect progress of work. Where possible, consider alternatives and take actions to avoid disputes and delays.

1.7 INSPECTIONS, TESTS AND REPORTS

- A. General: Required inspection and testing services are intended to assist in determination of probable compliances of work with requirements, but do not relieve Contractor of responsibility for those compliances, or for general fulfillment of requirements of contract documents. Specified inspections and tests are not intended to limit Contractor's quality control program. Afford reasonable access to agencies performing tests and inspections.
- B. Qualification of Testing Agencies: Except as otherwise indicated and except where manufacturer's testing facilities are indicated as acceptable, engage independent testing laboratories specializing in required services and acceptable to the Contracting Officer.
- C. Reports: Refer to Section, "Submittal Procedures" 013300.

1.8 OVERTIME WORK, UTILITY SHUTDOWN, SUSPENSION OF WORK

- A. Overtime Work:
 - 1. Work which is required to be performed outside of normal working hours of the building occupants.
- B. Schedule shutdown of a utility at least one week in advance with the Contracting Officer or his designated representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION PROVISIONS

- A. Installer's Inspection of Conditions: Require Installer of each major unit of work to inspect substrate to receive work, and conditions under which work will be performed, and to report (in writing to Contractor) unsatisfactory conditions. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

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- B. Manufacturer's Instructions: Where installations include manufactured products, comply with manufacturer's applicable instructions and recommendations for installation, to extent these are more explicit or more stringent than requirements indicated in contract documents.
- C. Inspect each item of materials or equipment immediately prior to installation, and reject damaged and defective items.
- D. Install work during conditions of temperature, humidity, exposure, forecasted weather, and status of project completion which will ensure best possible results for each unit of work, in coordination with entire work. Isolate each unit of work from noncompatible work, as required to prevent deterioration.
- E. Coordinate enclosure (closing-in) of work with required inspections and tests, so as to minimize necessity of uncovering work for that purpose.
- F. Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry-recognized standard mounting heights for applications indicated. Refer questionable mounting height choices to the Contracting Officer for final decision.

3.2 CLEANING AND PROTECTION

- A. General: During handling and installation of work at project site clean and protect work in progress and adjoining work on a basis of perpetual maintenance. Apply suitable protective covering on newly installed work where reasonably required to ensure freedom from damage or deterioration at time of substantial completion; otherwise, clean and perform maintenance on newly installed work as frequently as necessary through remainder of construction period.
- B. Limiting Exposures of Work: To extent possible through reasonable control and protection methods, supervise performance of work in a manner and by means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging, or otherwise deleterious exposures during construction period. Such exposures include (where applicable, but not by way of limitation) static loading, dynamic loading, internal pressures, external pressures, high or low temperatures, thermal shock, high or low humidity, air contamination or pollution, water, solvents, chemicals, light, puncture, abrasion, heavy traffic, soiling, bacteria, insect infestation, combustion, electrical current, unusual wear, misuse, incompatible interface, destructive testing, misalignment, unprotected storage, improper shipping/ handling, theft and vandalism.

3.3 ENVIRONMENTAL PROTECTION

- A. Solid, Liquid, and Gaseous Contaminants: Contractor shall be responsible for the proper disposal of all solid, liquid, and gaseous contaminants in accordance with all local codes and regulations, together with the following requirements:
 - 1. Discharge gaseous contaminants so that they will be sufficiently diluted with fresh air to reduce the toxicity to an acceptable level.
 - 2. Liquid contaminants may, subject to local utility standards, be diluted with water to a level of quality acceptable in the local sewer system, or shall be contained in approved vessels for disposal at approved sites.

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- B. Disposal of Refuse: Remove refuse resulting from construction operations from the site. Remove material in hampers in a fashion that does not disrupt daily operations of building as directed by Contracting Officer.
- C. Trucking:
 - 1. Load all trucks leaving the site with loose debris in a manner that will prevent dropping of materials on streets. Fasten suitable tarpaulins over the load before they enter surrounding paved streets. Trucks bringing loose materials over paved streets to the site shall be similarly loaded and covered.
 - 2. The Contractor and all subcontractors on or delivering to the site shall conform to all local regulations regarding load limits.
- D. Construction Site Maintenance:
 - 1. Store all supplies and equipment on project site so as to preclude mechanical and climatic damage. Maintain site in a neat and orderly manner.
 - 2. Contractor shall be responsible for maintaining the temporary structures and construction enclosure in good repair and visually pleasant
- E. Noise Control:
 - 1. Comply with all applicable state and local laws, ordinances, and regulations relative to noise control.
 - 2. Equipment to be employed on this site shall not produce a noise level exceeding the following limits in Db(A) at a distance of 50 feet from the equipment under test.
 - 3. Equipment:
 - a. Materials Handling
 - 1) Truck 91
 - b. Stationary
 - 1) pumps 76
 - 2) generators 78
 - 3) compressors 81
 - c. Impact
 - 1) pneumatic tools 86
 - d. Other
 - 1) saws 78
 - 2) vibrators 76

3.4 WORK RESTRICTIONS

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A Access:

1. The elevators must be available to the Jetport operations at all times.
2. Stairwells must be kept passable between occupied floors and building exits.

B. Housekeeping:

1. Keep active stairwells broom clean daily.
2. Provide carpet floor mat at active stairwell landings on occupied floors.

C. Safety:

1. Restrict application of products requiring respirator protection to unoccupied hours.
2. Fire Alarm, standpipe, all existing life safety components, and emergency power shall remain active throughout construction.

D. Noise:

1. Prohibit any construction activity during occupied hours that generates more than 75 decibels ambient noise in occupied space.

E. Power and Lighting:

1. Provide one week advance notice to Government for power outages.
2. Perform power outages that will affect occupants as directed by Contracting Officer.

END OF SECTION 013100

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SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 COORDINATION

- A. Coordinate both the timing and the listing of reports and other activities required by provisions of this and other sections, to provide consistency and logical coordination between submitted reports or lists. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make appropriate distribution of each report and updated report to entities involved in the work.
- B. Documentation of Existing: Provide videotape documentation of all existing to remain elements, including, but not limited to: windows, doors, wall paneling, judges' benches, witness boxes, bookcases, and cabinets, and submit for record prior to beginning work.

1.2 CONSTRUCTION PROGRESS SCHEDULE

- A. Refer to Construction Contract Clause "Schedules for Construction Contracts."
- B. Individual Work Stages: Show significant stages for each category or unit of work, including (where applicable), but not necessarily limited to, subcontract lettering, submittals, purchases, mockups, fabrication, sample testing, deliveries, installation, testing, adjusting, curing, start-up and placement into final use and operation.
- C. Distribution: Following the initial submittal to and response by the Contracting Officer, print and distribute progress schedule to the Contracting Officer (3 copies), separate Contractors (if any), principal subcontractors and suppliers or fabricators, and others with a need-to-know schedule-compliance requirement. When revisions are made, distribute updated issues to same entities, and post in same locations. Delete entities from distribution when they have completed their assigned work and are no longer involved in performance of scheduled work.

1.3 SCHEDULE SUBMISSIONS

- A. General: Submit construction progress schedule within 7 calendar days after the Notice to Proceed is received. The construction progress schedule shall include all work related submittals.
- B. Form: Prepare the schedule in chronological order of submittals. Show category of the submittal, name of subcontractor, a generic description of work covered, related section numbers, the activity or event number on the progress schedule, the scheduled date for first submittal, resubmittal, and the final release or approval by the Contracting Officer.
- C. Schedule Updating: Revise the schedule weekly, and each time revisions have been recognized or made. Resubmit for the Owner's review and comment.

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1.4 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format such as provided by Microsoft "Project" or similar scheduling program.
- B. Start-up Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work.
- C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
 - 1. Project requires access and work within the Jetport terminal gate areas which are subject to significant security restrictions. Indicate on the CMP schedule specific dates and times identifying this work. See Section 013000 for notification requirements in addition to this schedule requirement.
 - 2. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 60 days after date established for the Notice to Proceed.
 - 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 Architect's approval of the schedule.
 - 3. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
 - 4. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting dates.
 - 5. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to correlate with Contract Time.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the start-up network diagram, prepare a skeleton network to identify probable critical paths.
 - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Preparation and processing of submittals.
 - b. Mobilization and demobilization.
 - c. Purchase of materials.
 - d. Delivery.
 - e. Fabrication.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities including relocation of furnishings.
 - i. Punch list and final completion.
 - j. Activities occurring following final completion.

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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. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
 - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using a network fragment to demonstrate the effect of the proposed change on the overall project schedule.
- F. Initial Issue of Schedule: Prepare initial network diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:
1. Contractor or subcontractor and the Work or activity.
 2. Description of activity.
 3. Principal events of activity.
 4. Immediate preceding and succeeding activities.
 5. Early and late start dates.
 6. Early and late finish dates.
 7. Activity duration in workdays.
 8. Total float or slack time.
 9. Average size of workforce.
- G. Schedule Updating: Update schedule at a minimum on a weekly basis. Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
 2. Changes in early and late start dates.
 3. Changes in early and late finish dates.
 4. Changes in activity durations in workdays.
 5. Changes in the critical path.
 6. Changes in total float or slack time.
 7. Changes in the Contract Time.
- 1.5 REPORTS
- A. Daily Construction Reports: Prepare a daily construction report, recording the following information concerning events at the site; and submit duplicate copies to the Government Representative at weekly intervals:
1. List of subcontractors at the site.
 2. List of separate contractors at the site.
 3. Approximate count of personnel at the site.
 4. High and low temperatures, general weather conditions.
 5. Accidents (refer to accident reports).
 6. Meetings and significant decisions.

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7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, losses.
9. Meter readings and similar recordings.
10. Emergency procedures.
11. Orders and requests of governing authorities.
12. Change Orders received, implemented.
13. Services connected, disconnected.
14. Equipment or system tests and start-ups.
15. Partial Completions, occupancies.
16. Substantial Completions authorized.

- B. Field Correction Report: When the need to take corrective action that requires a departure from the Contract Documents arises, prepare a detailed report including a statement describing the problem and recommended changes. Indicate reasons the Contract Documents cannot be followed. Submit a copy to the Government Representative immediately.

1.6 SPECIAL REPORTS

- A. General: Submit special reports directly to the Government within one day of an occurrence. Submit a copy to the Government Representative and other parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List the chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Government Representative in advance when such events are known or predictable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01310

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SECTION 013300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. The types of submittal requirements specified in this section include shop drawings, product data, samples, certificates of conformance or compliance, certified test or inspection reports, and miscellaneous work-related submittals. Individual submittal requirements are specified in applicable sections for each unit of work.
- B. Requirements for record documents, progress and final photographs, and operation and maintenance manuals are covered in the "Project Close-out" section.

1.2 DEFINITIONS

- A. Work-related submittals of this section are categorized for convenience as follows:
 - 1. Shop drawings include specially-prepared technical data for this project, including drawings, diagrams, performance curves, data sheets, schedules, templates, patterns, reports, calculations, instructions, measurements and similar information not in standard printed form for general application to a range of similar projects.
 - 2. Product data include standard printed information on materials, products and systems; not specially-prepared for this project, other than the designation of selections from among available choices printed therein.
 - 3. Samples include both fabricated and unfabricated physical examples of materials, products and units of work; both as complete units and as smaller portions of units of work; either for limited visual inspection or (where indicated) for more detailed testing and analysis. Mock-ups are a special form of samples, which are too large or otherwise inconvenient for handling in specified manner for transmittal of sample submittals.
 - 4. Certificates of conformance or compliance are documents attesting that a product complies with a specified standard.
 - 5. Certified test (or inspection) reports are documents attesting that a product meets a specified level of performance or quality when a prototype specimen is tested or inspected in accordance with a specified procedure, and consist of a certified statement by the product supplier or Contractor accompanied by a complete report of the inspection or test.
 - 6. Miscellaneous submittals related directly to the work (non-administrative) include warranties, maintenance agreements, workmanship bonds, project photographs, survey data and reports, physical work records, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work and not processed as shop drawings, product data samples, certificates of conformance or compliance, or certified test reports.
 - 7. Secure FTP Site: AMEC maintains an FTP site that has been cleared by GSA as secure. Use of this site will be expected as part of the transmission of documents being submitted for approval. AMEC will provide access to one Contractor personnel upon their receipt of clearance documentation.

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1.3 GENERAL SUBMITTAL REQUIREMENTS

A. General:

1. All submittals shall be made to the Contracting Officer or to an individual designated by the Contracting Officer, or as outlined and agreed on by the GSA during the PreConstruction Meeting.
2. Only the Contracting Officer or an individual designated by him in writing can approve or disapprove submittals. Deviations and variations from the contract requirements contained in the submittal can be approved only by the Contracting Officer or an individual delegated such authority in writing by the Contracting Officer.
3. Failure on the part of the Contractor to indicate approval on submittals prior to submission to Contracting Officer will result in their being returned to the Contractor without being acted upon.
4. No delays in construction occasioned by the Contractor's failure to submit material for approval in accordance with the approved schedule will be excused.
5. It is the intent of this project to process submittals in a "paperless" fashion through the use of a Owner approved secure FTP site. This will be reviewed and coordinated at the PreConstruction meeting.

B. Scheduling: Submit schedule of submissions for approval by the Contracting Officer, within 7 calendar days after notice to proceed is received, unless otherwise stated.

C. All required submittals shall be submitted not later than 2 months prior to Contract Completion Date.

1. If any required submittals are not made within the stipulated time frame, the Contractor's monthly progress payments shall be reduced by 10% each and every month that the submittals remain outstanding. This with-holding will be released upon receipt of the outstanding submittals.

D. Coordination and Sequencing: Submittals shall be generated and submitted on a specification by specification basis, and all submittals required in a specific specification section shall be submitted together as one package. Each required submittal within the specification section will be numbered independently to allow the processing of individual items. Submittals not included but required at the project completion will be identified. Coordinate the preparation and processing of submittals with performance of the work so that work will not be delayed by submittals. Coordinate and sequence different categories of submittals for same work, and for interfacing units of work, so that one will not be delayed for coordination of the Contracting Officer's review with another.

E. Preparation of Submittals: Provide permanent marking on each submittal to identify project, date, Contractor, subcontractor, submittal name and similar information to distinguish it from other submittals.

F. Show Contractor's executed review and approval marking and provide space for the Contracting Officer's action marking. Package each submittal appropriately for transmittal and handling.

1. Submittals which are received from sources other than through Contractor's office will be returned without action.

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2. Submittals which are received but have not been reviewed and stamped by the Contractor will be returned without review.
- G. Transmittal Form: Shall be on Contractor Letterhead and shall identify the Specification Section of each submittal.

1.4 SPECIFIC-CATEGORY SUBMITTAL REQUIREMENTS

- A. General: Except as otherwise indicated in individual work sections, comply with requirements specified herein for each indicated category of submittal. Provide and process intermediate submittals, where required between initial and final, similar to initial submittals.
- B. Shop Drawings: Refer to clause "Shop Drawings, Coordination Drawings, and Schedules" of the Contract Clauses. Provide newly-prepared information, on reproducible sheets, with graphic information at accurate scale (except as otherwise indicated), with name of preparer indicated (firm name). Show dimensions and note which are based on field measurement. Identify materials and products in the work shown. Indicate compliance with standards, and special coordination requirements. Do not allow shop drawing copies that have not been reviewed or have been disapproved to be used in connection with the work.
1. Submit for Review: Provide in PDF format and post to the secure FTP site.
 2. The Contractor shall be responsible for reproduction and distribution of reviewed shop drawings to his subcontractors.
- C. Product Data: Collect required data into one submittal for each unit of work or system; and mark each copy to show which choices and options are applicable to project. Include manufacturer's standard printed recommendations for application and use, compliance with standards, application of labels and seals, notation of field measurements which have been checked, and special coordination requirements. Maintain one set of product data (for each submittal) at project site, available for reference.
1. Submittals: Contractor shall not submit product data, or allow its use on the project, until he has confirmed compliance with requirements of contract documents. Submittal is for information and record, unless otherwise indicated. Initial submittal is final submittal unless returned by the Contracting Officer, marked with an action which indicates an observed noncompliance. Provide in PDF format and post to the secure FTP site.
 - a. Installer's Copy: Do not proceed with installation of materials, products or systems until final copy of applicable product data is in possession of Installer.
- D. Samples: (Refer to clause "Samples" of Contract Clauses.) Provide units identical with final condition of proposed materials or products for the work. Include "range" samples (not less than 3 units) where unavoidable variations must be expected, and describe or identify variations between units of each set. Provide full set of optional samples on project site where the Contracting Officer's selection is required. Prepare samples to match the Government-furnished sample where so indicated. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.

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1. Submittal: At Contractor's option, provide preliminary submittal of a single set of samples for review and action. Otherwise, initial submittal is final submittal unless returned with action which requires resubmittal. Submit 3 sets of samples in final submittal; one set will be returned.
 2. Quality Control Set: Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons.
- E. Certificates of Conformance or Compliance: Follow same procedure as for product data. Where feasible, and/or where required by other sections of specification indicate compliance with the specified standard by means of a label on the container, or on an inconspicuous place on the product.
- F. Certified Test and Inspection Reports: Process each as either "shop drawing" or "product data", depending upon whether report is uniquely prepared for project or a standard publication of workmanship control testing at point of production; process accordingly.
1. Report shall include a description of the prototype specimen tested or inspected which is sufficiently descriptive to ensure positive identification of the product by an inspector when delivered and/or installed.
 2. The report shall be accompanied by a notarized statement from the supplier of the product certifying that the prototype is identical in all respects to the product proposed for the project.
 3. Where feasible and/or where required by other sections of the specification, indicate compliance with the specified performance or quality by means of a label on the container or on an inconspicuous place on the product. The label shall refer to the test or inspection report and include the date of the report.
- G. Warranties (Guarantees): In addition to copies desired for Contractor's use, furnish in PDF format and post to the secure FTP site, except furnish additional (conformed) copies where required for maintenance manuals.
- H. Standards/Manufacturer's Recommendations: Where copy submittal is indicated, and except where specified integrally with "Product Data" submittal, submit in PDF format and post to the secure FTP site. Where workmanship at project site and elsewhere is governed by standard, furnish additional copies to fabricators, installers and others involved in performance of the work. Installation of the item will not be allowed to proceed until the information is received. Failure to furnish the information can be cause for rejection of the material.
- I. Close-out Submittals: Refer to individual work sections and to "close-out" section for specific requirements on submittal of close-out information, materials, tools and similar items.
- J. General Distribution: Provide additional distribution of submittals (not included in foregoing copy submittal requirements) to subcontractors, suppliers, fabricators, installers, and others as necessary for proper performance of the work.
- 1.5 ACTION ON SUBMITTALS
- A. Contracting Officer's Action: Where action and return is required or requested, the Contracting Officer, or the Contracting officer's designated representative, will review each submittal, mark with Action, and where possible return within 2 weeks of receipt. Where submittal must be held for coordination, Contractor will be so advised.

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1. Final Unrestricted Release: Work may proceed, provided it complies with contract documents, when submittal is returned marked "No Exceptions Taken".
2. Final-But-Restricted Release: Work may proceed, provided it complies with notations and corrections on submittal and with contract documents, when submittal is returned marked "Approved as Noted."
3. Resubmittal Required, Restricted Release: Work may proceed provided it complies with notations and corrections and any additional information requested on the submittal and with contract documents when submittal is returned marked "Approved as Noted, Resubmittal Required". Resubmittal is required to make the corrections and provide requested information noted.
4. Disapproved, Resubmit: Do not proceed with work. Revise submittal in accordance with notations thereon, and resubmit without delay to obtain a different action marking. Do not allow submittals marked "Disapproved, Resubmit" (or unmarked submittals where a marking is required) to be used in connection with performance of the work.
5. Other Action: Where submittal is returned for other reasons, with the Contracting Officer's explanation included, it will be marked "Action Not Required."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013300

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SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for 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.
 - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
 - 2. 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.
 - 3. Requirements for Contractor to provide quality-assurance and -control services required by Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
 - 1. Divisions 2 through 33 Sections for specific test and inspection requirements.

1.3 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. Services do not include contract enforcement activities performed by Owner.
- 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 an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

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- 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: 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 tradespeople of the corresponding generic name.
- I. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

- A. General: If compliance with two or more standards is specified and the standards 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 the Contracting Officer for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or 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.

1.5 SUBMITTALS

- A. 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.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
 - 1. Specification Section number and title.
 - 2. Description of test and inspection.
 - 3. Identification of applicable standards.
 - 4. Identification of test and inspection methods.
 - 5. Number of tests and inspections required.
 - 6. Time schedule or time span for tests and inspections.
 - 7. Entity responsible for performing tests and inspections.

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8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

C. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspectng.

D. Permits, Licenses, and Certificates: For Owner's 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.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. 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.
- C. 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.
- D. 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.
- E. 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. 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.
- F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

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1. Requirement for specialists shall not supersede building codes and regulations governing the Work.
- 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 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.
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.
- 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.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
 - e. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.
 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Contracting Officer with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
 3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction.

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Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
 - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
 2. Notify testing agencies at least 48 hours in advance of time when Work that requires testing or inspecting will be performed.
 3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
 4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
 5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. **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 as specified in Division 1 Section "Submittal Procedures."
- D. **Retesting/Reinspecting:** Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- E. **Testing Agency Responsibilities:** Cooperate with Contracting Officer 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 a certified written report, in duplicate, 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.
 6. Do not perform any duties of Contractor.
- F. **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.

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- G. 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.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 the Notice to Proceed.
 - 1. Distribution: Distribute schedule to Owner, Contracting Officer testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
 - 1. Date test or inspection was conducted.
 - 2. Description of the Work tested or inspected.
 - 3. Date test or inspection results were transmitted to Government.
 - 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Contracting Officer reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
 - 2. Comply with the Contract Document requirements for Division 1 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 014000

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SECTION 014200 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.1 DEFINITIONS:

- A. General Explanation: A substantial amount of specification language consists of definitions of terms found in other contract documents, including drawings. (Drawings are recognized as being diagrammatic in nature and not completely descriptive of requirements indicated thereon). Certain terms used in contract documents are defined in this article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the work to the extent that they are not stated more explicitly in another element of contract documents.
- B. Special Conditions: Wherever the term "Special Conditions" or "Section, Special Conditions" is used in the specifications, it refers collectively to all of the sections in Division 1, General Requirements, and to document 00120 entitled "Supplementary Instructions to Bidders" and 00800 titled "Supplementary Conditions."
- C. Indicated: The term "Indicated" is a cross-reference to graphic representations, notes or schedules on drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used in lieu of "indicated", it is for purpose of helping reader locate cross-reference, and no limitation of location is intended except as specifically noted.
- D. Directed, Requested, etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Contracting Officer", "requested by the Contracting Officer", and similar phrases. However, no such implied meaning will be interpreted to extend the Contracting Officer's responsibility into Contractor's area of construction supervision.
- E. Approve: Only the Contracting Officer, or an individual designated by him in writing, can approve or disapprove contract actions. Even if the specifications indicate that an individual other than the Contracting Officer (such as the "Approval Authorities" or "Contracting Officer's Representative" or "Architect") will approve or disapprove an action, it is understood that only the Contracting Officer has this authority unless the individual is so designated by him in writing. Even when an individual is so designated, the Contractor may appeal the action to the Contracting Officer and the Contracting Officer's decision shall be final. In no case will "approval" by the Contracting Officer be interpreted as a release of the Contractor from responsibility to fulfill requirements of contract documents.
- F. Government Representative: A government employee, or contracted consultant, assigned to manage activities for the government during the course of the construction of the project, i.e., the Contracting Officer's representative on the site.
- G. Project Site: The space available to Contractor for performance of the work, either exclusively or in conjunction with others performing other work as part of the project. The extent of project site is shown on drawings, and may or may not be identical with description of land upon which project is to be built.

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- H. Furnish: Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
 - I. Install: Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations, as applicable in each instance.
 - J. Provide: Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
 - K. Installer: The term "Installer" is defined as the entity (person or firm) engaged by the Contractor or its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. Installers shall be skilled in the work they are to perform.
 - L. Specialist: The term "Specialist" means an individual or firm of established reputation (or, if newly organized, whose personnel have previously established a reputation in the same field), which is regularly engaged in, and which maintains a regular force of workmen skilled in either (as applicable) manufacturing or fabricating items required by the contract, installing items required by the contract, or otherwise performing work required by the contract. Where the contract specification requires installation by a specialist, that term shall also be deemed to mean either the manufacturer of the item, an individual or firm licensed by the manufacturer, or an individual or firm who will perform the work under the manufacturer's direct supervision.
 - M. Testing Laboratory: The terms "testing laboratory" or "independent laboratory" are interchangeable, and are defined as an independent entity engaged by the Contractor to perform specific inspections or tests of the work, either at project site or elsewhere; and to report results of those inspections or tests.
 - N. Nationally Recognized Testing Laboratories: The term "nationally recognized testing laboratory (NRTL)" shall mean a firm or organization which is recognized by OSHA in accordance with 29 CFR Part 1910.7 to test and approve (i.e., certify, label or list) equipment or materials as being safe for the intended use. Labeling and/or listing of products by NRTL's is acceptable wherever a reference to the UL or FMRC label is made in the specifications.
 - O. Label: The label must be provided by a nationally recognized testing laboratory. The contractor shall provide a statement from the testing laboratory attesting that the laboratory has been approved by OSHA to certify the category of product(s) being submitted for approval.
- 1.2 OVERLAPPING AND CONFLICTING ASSIGNMENTS:
- A. Specifications and Drawings: Where there appear to be overlapping or conflicting requirements in the drawings and specifications, the order of precedence established by the clauses "Specifications and Drawings for Construction" and "Specifications and Drawings" of the Contract Clauses shall govern.
 - B. Industry Standards: Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, the most stringent requirement shall govern.

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- C. Contractor's Options: Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether or not it is specifically indicated as such.

1.3 MINIMUM QUALITY/QUANTITY:

- A. In every instance, the quality level or quantity shown or specified is intended to be the minimum for the work to be performed or provided. Except as otherwise specifically indicated, the actual work may either comply exactly with that minimum (within specified tolerances), or may exceed that minimum within reasonable limits. In complying with requirements, indicated numeric values are either minimums or maximums as noted or as appropriate for context of requirements. Refer instances of uncertainty to the Contracting Officer for decision before proceeding.

1.4 ASSIGNMENT OF SPECIALISTS:

- A. In certain instances, specification text requires that specific work is to be assigned to specialists who must be engaged for performance of that work. Such assignments are special requirements over which the Contractor has no choice or option. These requirements should not be interpreted so as to conflict with applicable regulations, union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of requirements remains with the Contractor.

1.5 DRAWING SYMBOLS:

- A. General: Except as otherwise indicated, graphic symbols used on drawings are those symbols recognized in the construction industry for purposes indicated or as indicated.
- B. Mechanical/Electrical Drawings: Graphic symbols used on mechanical/electrical drawings are generally aligned with symbols recommended by ASHRAE. Where appropriate, those symbols are supplemented by more specific symbols where appropriate as recommended by other recognized technical associations including ASME, ASPE, IEEE and similar organizations. Refer instances of uncertainty to the Contracting Officer for clarification before proceeding.

1.6 INDUSTRY STANDARDS:

- A. General Applicability of Standards: Except where more explicit or more stringent requirements are written directly into the contract documents, applicable standards of construction industry have same force and effect (and are made a part of contract documents by reference) as if copied directly into contract documents, or as if published copies were bound herewith, subject to the order of precedence previously stated.
- B. Publication Dates: Refer to clause "Standard References" of Construction Contract Clauses. Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect as of Invitation for Bids.
 - 1. Updated Standards: Submit a change order proposal where an applicable industry standard has been revised and reissued after the date of the contract documents and before the performance of the work affected. The Contracting Officer will decide whether to issue a change order to proceed with the updated standard.

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- C. Copies of Standards: Maintain copy of referenced standards, including those referenced in the referenced standards and where required manufacturer's instructions, where work is being performed, and make available to the Construction Engineer or inspector on request.
- D. Abbreviations and Names: The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA	Aluminum Association 818 Connecticut Ave. NW Washington DC 20006
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005
AAMA	American Architectural Manufacturer's Association 2700 River Road, Suite 118 Des Plaines, IL 60018
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219
ACIL	American Council of Independent Laboratories 1725 K Street, NW Washington, DC 20006
ACS	Acoustical Society of America 335 East 45th Street New York, NY 10017
ADC	Air Diffusion Council 230 N. Michigan Ave., Suite 1200 Chicago, IL 60611
AGA	American Gas Association 1515 Wilson Blvd. Arlington, VA 22209
AHA	American Hardboard Association 877-B Wilmette Road Palatine, IL 60067
AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006

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AIHA	American Industrial Hygiene Association 475 Wolf Ledges Parkway Akron, OH 44311
AISC	American Institute of Steel Construction 400 N. Michigan Ave., 8th Floor Chicago, IL 60611
ALI	Associated Laboratories, Inc. Eight Brush Street Pontiac, MI 48053
ALSC	American Lumber Standards Committee P. O. Box 210 Germantown, MD 20874
AMCA	Air Movement and Control Association 30 W. University Drive Arlington Heights, IL 60004
ANSI	American National Standards Institute 655 Fifteenth Street, NW, Suite 300 Washington, DC 20015
APA	American Plywood Association P.O. Box 11700 Tacoma, WA 98411
API	American Petroleum Institute 1220 L Street, NW Washington, DC 20005
ARI	Air Conditioning and Refrigeration Institute 1501 Wilson Blvd. Arlington, VA 22209
ASC	Adhesive and Sealant Council 1600 Wilson Blvd., Suite 910 Arlington, VA 22209
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017

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ASPE	American Society of Plumbing Engineers 15233 Ventura Blvd., Suite 811 Sherman Oaks, CA 91403
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140
ASTM	ASTM 1916 Race Street Philadelphia, PA 19103
AWI	Architectural Woodwork Institute 2310 S. Walter Reed Drive Arlington, VA 22206
AWS	American Welding Society P.O. Box 351040 550 Le Jeune Road, NW Miami, FL 33135
AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235
BHMA	Builders' Hardware Manufacturers Association 60 East 42nd St., Room 511 New York, NY 10165
BIFMA	Business and Institutional Furniture Manufacturer's Association 2335 Burton Street, SE Grand Rapids, MI 49506
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1230 Keith Building Cleveland, OH 44115
CDA	Cooper Development Association Box 1840, Greenwich Office Park 2 Greenwich, CT 06836
CE	Corps of Engineers (U.S. Department of the Army) Chief of Engineers - Referral Washington, DC 20314
CFR	Code of Federal Regulations (Available from the Government Printing Office) North Capitol Street between G and H Streets, NW Washington, DC 20402

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(Material is usually first published in the Federal Register)

CGA	Compressed Gas Association 1235 Jefferson Davis Highway Arlington, VA 22202
CPSC	Consumer Product Safety Commission 1111 Eighteenth Street, NW Washington, DC 20207
CRI	Carpet and Rug Institute Box 2048 Dalton, GA 30720
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Road Schaumburg, IL 60195
CS	Commercial Standard (U.S. Department of Commerce) Government Printing Office Washington, DC 20402
DHI	Door and Hardware Institute 7711 Old Springhouse Road McLean, VA 22102
DLPA	Decorative Laminate Products Association (Formerly the National Association of Plastic Fabricators) Hulman Building, 20th Floor 120 West Second Street Dayton, OH 45402
DOC	Department of Commerce 14th Street and Constitution Avenue, NW Washington, DC 20230
DOT	Department of Transportation 400 Seventh Street, SW Washington, DC 20590
ECSA	Exchange Carriers Standards Association Four Century Drive, 3rd Floor Parsippany, NJ 07054
EIA	Electronic Industries Association 2001 Eye Street, NW Washington, DC 20006

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EPA	Environmental Protection Agency 401 M Street, SW Washington, DC 20460
ETL	ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045
FCI	Fluid Controls Institute P.O. Box 9036 Morristown, NJ 07960
FGMA	Flat Glass Marketing Association White Lakes Professional Building 3310 Harrison Topeka, KS 66611
FHA	Federal Housing Administration (U.S. Department of Housing and Urban Development) 451 Seventh Street, SW Washington, DC 20201
FM	Factory Mutual System 1151 Boston-Providence Turnpike Norwood, MA 02062
FS	Federal Specification (General Services Administration) Specifications Units (WFCIA) 7th and D Streets, SW Washington, DC 20406
GA	Gypsum Association 1603 Orrington Ave. Evanston, IL 60201
GSA	General Services Administration 18th and F Streets, NW Washington, DC 20405
HEI	Heat Exchange Institute 1230 Keith Building Cleveland, OH 44115
HI	Hydronics Institute P. O. Box 218 35 Russo Place Berkeley Heights, NJ 07922

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HMA	Hardwood Manufacturers Association 805 Sterick Building Memphis, TN 38103
ICEA	Insulated Cable Engineers Association, Inc. P. O. Box P South Yarmouth, MA 02664
IEC	International Electrotechnical Commission (Available from ANSI) 655 Fifteenth Street, NW, Suite 300 Washington, DC 20015
IEEE	Institute of Electrical and Electronics Engineers 345 E. 47th Street New York, NY 10017-2394
IES	Illuminating Engineering Society of North America 120 Wall Street, 17 th floor New York, NY 10005-4001
IGCC	Insulating Glass Certification Council Route 11, Industrial Park Cortland, NY 13045
IRI	Industrial Risk Insurers 85 Woodland Street Hartford, CT 06102
ISA	Instrument Society of America P.O. Box 12277; 67 Alexander Drive Research Triangle Park, NC 27709
MCA	Mechanical Contractor's Association of America 5410 Grosvenor Lane; Suite 120 Bethesda, MD 20814
MIL	Military Standardization Documents (U.S. Department of Defense) Naval Publications and Forms Center 5801 Tabor Avenue Philadelphia, PA 19120
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180
NAAMM	National Association of Architectural Metal Manufacturers 221 N. LaSalle Street Chicago, IL 60601

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NAPF	National Association of Plastic Fabricators (Now DLPA)
NBHA	National Builder's Hardware Association (Now Part of DHI) 711 Old Springhouse Road McLean, VA 22101
NBS	National Bureau of Standards (U.S. Department of Commerce) Gaithersburg, MD 20234
NCRPM	National Council on Radiation Protection and Measurement 7910 Woodmont Avenue, Suite 1016 Bethesda, MD 20814
NEC	National Electrical Code (by NFPA)
NECA	National Electrical Contractors Association 7315 Wisconsin Avenue Bethesda, MD 20814
NEII	National Elevator Industry, Inc. 600 Third Avenue New York, NY 10016
NEMA	National Electrical Manufacturers Association 2101 L Street, NW, Suite 300 Washington, DC 20037
NFPA	National Fire Protection Association Batterymarch Park Quincy, MA 02269
N.F.P.A.	National Forest Products Association 1619 Massachusetts Ave., NW Washington, DC 20036
NHLA	National Hardwood Lumber Association P.O. Box 34518 Memphis, TN 38184
NPA	National Particleboard Association 18928 Premiere Court Gaithersburg, MD 20879
NPCA	National Paint and Coating Association 1500 Rhode Island Avenue, NW Washington, DC 20005

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NWMA	National Woodwork Manufacturers Association (Now NWWDA)
NWWDA	National Wood Window and Door Association (Formerly NWMA) 205 West Touhy Avenue Park Ridge, IL 60068
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) Government Printing Office Washington, DC 20402
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive, Suite 12-B Rockville, MD 20805
RMA	Rubber Manufacturers Association 1400 K Street, NW Washington, DC 20005
SAMA	Scientific Apparatus Makers Association 1101 - 16th Street, NW Washington, DC 20036
SDI	Steel Deck Institute P.O. Box 3812 St. Louis, MO 63122
S.D.I.	Steel Door Institute (c/o A. P. Wherry and Associates, Inc.) 14600 Detroit Avenue Cleveland, OH 44107
SGCC	Safety Glazing Certification Council Route 11, Industrial Park Cortland, NY 13045
SHLMA	Southern Hardwood Lumber Manufacturers Association (Now HMA)
SIGMA	Sealed Insulating Glass Manufacturers Association 111 E. Wacker Drive Chicago, IL 60601

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SMACNA	Sheet Metal and Air Conditioning Contractor's National Association P.O. Box 70 Merrifield, VA 22116
SSPC	Steel Structures Painting Council 4400 Fifth Avenue Pittsburgh, PA 15213
SWI	Steel Window Institute (c/o Thomas Associates, Inc.) 1230 Keith Building Cleveland, OH 44115
TCA	Tile Council of America P.O. Box 326 Princeton, NJ 08540
TIMA	Thermal Insulation Manufacturer's Association 7 Kirby Plaza Mt. Kisco, NY 10549
UL	Underwriters Laboratories 333 Pfingsten Road Northbrook, IL 60062
USDA	U.S. Department of Agriculture Independence Avenue between 12th and 14th Streets, SW Washington, DC 20250
USPS	U.S. Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260
WIC	Woodwork Institute of California P.O. Box 11428 Fresno, CA 93773
WRI	Wire Reinforcement Institute 8361 A Greensboro Drive McLean, VA 22102
WSC	Water Systems Council 221 North LaSalle St. Chicago, IL 60601
WSFI	Wood and Synthetic Flooring Institute 4415 West Harrison Street, Suite 242C Hillside, IL 60162
WWPA	Western Wood Products Association 1500 Yeon Building Portland, OR 97204

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W.W.P.A. Woven Wire Products Association
2515 N. Nordica Ave.
Chicago, IL 60635

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 014200

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in other contract documents. These requirements have been included for special purposes as indicated. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but are not limited to, utility services, construction facilities, security/protection provisions, and support facilities.

1.2 JOB CONDITIONS

- A. General: Establish and initiate use of each temporary facility at time first reasonably required for proper performance of the work. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.
- B. Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.
- C. Existing Equipment on Site: Cover equipment that is to remain in place within the area of contract operations and protect it against damage or loss. Store equipment that is removed in performance of work where directed or reuse in work as required by drawings and specifications. Equipment temporarily removed shall be protected, cleaned and replaced equal to its condition prior to starting work. Security for equipment or material that is to be reused and is removed for temporary storage shall be the sole responsibility of the Contractor.

1.3 OWNER OCCUPIED REQUIREMENTS

- A. Refer to Section 013100 for specific daily work requirements regarding protection of occupied spaces during construction.

1.3 SECURE BARRIER SUBMITTAL

- A. Provide schedule, plans, and detail information for secure plywood barrier in Terminal area.

PART 2 - PRODUCTS (Not Applicable)

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PART 3 - EXECUTION

3.1 TEMPORARY UTILITY SERVICES:

- A. Water: Premises are supplied with water services which may be used in this work, subject to regulations of the government agency in control. Where non-potable water is used, mark each outlet with health hazard warning signs.
- B. Electric Power: Premises are supplied with electrical services which may be used in this work, subject to regulations of the government agency in control.

3.2 TEMPORARY CONSTRUCTION FACILITIES:

- A. The types of temporary construction facilities required include, but are not limited to, enclosure of work, ventilation, and lighting. Provide facilities reasonably required to perform construction operations properly and adequately.
- B. Enclosures: When temporary enclosures are required to ensure adequate workmanship or dust protection, provide tarpaulins with UL label and flame spread of 15 or less.
- C. Electrical Facilities: Provide all temporary electrical facilities, including lamps, required for construction and safety operations. Remove all such equipment when permanent connections have been completed. Where it is determined, during construction, that the temporary facilities, as installed, interfere with Government operations or other construction operations and, when notified by the Contracting Officer, relocate said facilities in an approved manner at no cost to the Government. No wire, bus or electrical equipment which is part of any of the permanent electrical systems may be used for temporary electrical service for construction operations, unless specifically approved by the Contracting Officer. Temporary connections shall be in accordance with NEC and OSHA requirements. The Contractor shall be responsible for any damage or injury to equipment, materials, or personnel caused by improperly protected temporary installations. All costs for materials and installation for temporary electrical facilities and energy for their operation shall be at the expense of the Contractor. The hours of operation, level of illumination and coverage for safety of personnel shall meet the minimum requirements of OSHA.
- D. Access Provisions: Provide ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation.

3.3 SECURITY PROVISIONS:

- A. General: Provide security services and systems such as to achieve 24-hour, 7 days per week protection from theft, vandalism, personal injury and property damage. Refer to Section 01546, "Safety and Health." Provisions shall include, but not be limited to the following:
 - 1. Provide dustproof enclosures for protection where dirty work is performed. Dampen debris when removed to avoid dusting.
 - 2. Building Enclosure and Lockup: Secure floor area against unauthorized entrance at times when personnel are not working.

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3. Provide secure floor to ceiling plywood barriers in the Terminal/Gate area subject to significant security requirements. Provide Contracting Officer schedule, plans, and construction of barrier for approval by the Jetport and TSA.

3.5 TEMPORARY SUPPORT FACILITIES:

- A. General: The types of temporary support facilities required include, but are not limited to, field offices, sanitary facilities, drinking water, first aid facilities, bulletin board, private and public telephones, clocks, thermometer, project identification signs, cleanup facilities, waste disposal service, rodent/pest control and similar miscellaneous general services, all as may be reasonably required for proficient performance of the work and accommodation of personnel at the site. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by the Contracting Officer and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.
- B. Sanitary Facilities: Contractor's personnel may use toilet rooms on the premises subject to regulation and control of the Contracting Officer or his designated representatives.

END OF SECTION 015000

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TEMPORARY FACILITIES AND CONTROLS

015000 - 3

AMEC Environment & Infrastructure , Inc.

SECTION 016000 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. General: Refer to clause, "Materials and Workmanship" of the Contract Clauses. Unless otherwise specifically provided in this contract, reference to any equipment, material, article, or patented process, by trade name, make, or catalog number, shall be regarded as establishing a standard of quality and shall not be construed as limiting competition. Subject to compliance with specified requirements, the Contractor may, at his option, use any equipment, material, article, or process which, in the judgment of the Contracting Officer, is equal to that named.
- B. Definitions: "Products" is defined to include purchased items for incorporation into the work, regardless of whether specifically purchased for project or taken from Contractor's stock of previously purchased products. "Materials" is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined or otherwise fabricated, processed, installed or applied to form units of work. "Equipment" is defined as products with operational parts, regardless of whether motorized or manually operated, and particularly including products with service connections (wiring, piping, etc.). Definitions in this paragraph are not intended to negate the meaning of other terms used in contract documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.
- C. Standards: Refer to Division 1 section "Definitions and Standards" for applicability of industry standards to products of project, and for acronyms used in text of specification sections.

1.2 SUBMITTALS

- A. Requests for Substitutions: Requests for substitutions shall be treated as a contract change and shall be subject to clauses "Changes" and "Equitable Adjustments" in General Conditions. Submit **7** copies, fully identified for product or method being replaced by substitution, including related specification section and drawing number(s), and fully documented to show compliance with requirements for substitutions. Include product data/drawings, description of methods, samples where applicable, Contractor's detailed comparison of significant qualities between specified item and proposed substitution, statement of effect on construction time and coordination with other affected work, cost information or proposal, and Contractor's statement to the effect that proposed substitution will result in overall work equal-to-or-better-than work originally indicated.
- B. Labels and Listings: Where equipment or materials are specified to conform to requirements of the standards of organizations such as American Society of Mechanical Engineers (ASME), Underwriters Laboratories Inc. (UL), American Gas Association (AGA), American Refrigeration Institute (ARI), Air Diffusion Council (ADC), Sheet Metal and air-conditioning Contractors National Association, Inc. (SMACNA), and Air Moving and Conditioning Association (AMCA) or other organizations that use a label or listing as a method of indicating compliance, submit proof of such conformance to the Contracting Officer for approval. The label or listing of the specified organization will be acceptable

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evidence. In lieu of the label or listing, the Contractor may submit a notarized certificate from a nationally recognized testing organization, adequately equipped and competent to perform such services and approved by the Contracting Officer, stating that the item has been tested in accordance with the specified organization's test methods and that the item conforms to the specified organization's standard or code. For materials whose compliance with organizational standards or specifications is not regulated by an organization using its own listing or label as proof of compliance, furnish a notarized certificate from the manufacturer stating that the material complies with the applicable referenced standard or specification.

- C. Work Related Submittals: Contractor's submittal of (and Government acceptance of) shop drawings, product data or samples which relate to work not complying with requirements of contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

1.3 QUALITY ASSURANCE

- A. Source Limitations: To the greatest extent possible for each unit of work, and subject to the restrictions of the Buy American Act, provide products, materials or equipment of a singular generic kind from a single source.
- B. Compatibility of Options: Where more than one choice is available as options for Contractor's selection of a product or material, select an option which is compatible with other products and materials already selected (which may have been from among options for those other products and materials). Total compatibility among options is not assured by limitations within contract documents, but must be provided by Contractor. Compatibility is a basic general requirement of product/material selections.

1.4 PRODUCT DELIVERY-STORAGE-HANDLING

- A. General: Deliver, handle and store products in accordance with manufacturer's recommendations and by methods and means which will prevent damage, deterioration, and loss including theft and protect against damage from climatic conditions. Control delivery schedules to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other sources of loss. Damaged or defective items, in the opinion of the Contracting Officer shall be replaced at no cost to the Government.

1.5 WARRANTIES (GUARANTEES)

- A. General: The warranty and guarantee provisions of the Contract Clauses apply to all work of the contract, including but not limited to, the following specific categories related to individual units of work specified in sections of Divisions 2 through 16 of these specifications:
 - 1. Specified Product Warranty: A warranty which is required by contract documents, to be provided for a manufactured product incorporated into the work, regardless of whether manufacturer has published a similar warranty without regard for specific incorporation of product into the work, or has written and executed a special project warranty as a direct result of contract document requirements.

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2. Coincidental Product Warranty: A warranty which is not specifically required by contract documents (other than as specified in this Section); but which is available on a product incorporated into the work, by virtue of the fact that manufacturer of product has published warranty in connection with purchases and users of product without regard for specific applications except as otherwise limited by terms of warranty.
- B. Refer to individual sections of Divisions 02 through 33 for the determination of units of work which are required to be specifically or individually warranted, and for the specific requirements and terms of those warranties (or guarantees), in excess of what the Contract Clauses require.

PART 2 - PRODUCTS

2.1 GENERAL PRODUCT COMPLIANCES

- A. General: The compliance requirements for individual products, as indicated in contract documents, are multiple in nature and may include generic, descriptive, performance, prescriptive, compliance with standards, conformance with graphic details and other similar forms and methods of indicating requirements, all of which must be complied with.
- B. Procedures for Selecting Products: Contractor's options for selecting products are limited by contract document requirements, and governing regulations, and are not controlled by industry traditions or procedures experienced by Contractor on previous construction projects. Required procedures include, but are not necessarily limited to, the following for various indicated methods of specifying:
1. Standards, Codes and Regulations: Where only compliance with an imposed standard, code or regulation is required, selection from among products which comply with requirements including those standards, codes and regulations, is Contractor's option.
 2. Performance Requirements: Provide products which comply with specific performances indicated, and which are recommended by manufacturer (in published product literature or by individual certification for application indicated. Overall performance of a product is implied where product is specified with only certain specific performance requirements.
 3. Prescriptive Requirements: Provide products which have been produced in accordance with prescriptive requirements, using specified ingredients and components, and complying with specified requirements for mixing, fabricating, curing, finishing, testing and similar operations in manufacturing process.
 4. Visual Matching: Where matching with an established sample is required, final judgment of whether a product proposed by Contractor matches sample satisfactorily is the Contracting Officer's.
 5. Visual Selection: Except as otherwise indicated, where specified product requirements include "...as selected from manufacturer's standard colors, patterns, textures..." or words of similar effect, the selection of manufacturer and basic product (complying with requirements) is Contractor's option and subsequent selection of color, pattern and texture is the Contracting Officer's selection.

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2.2 GENERAL PRODUCT REQUIREMENTS

- A. General: Provide products which comply with the clause "MATERIALS AND WORKMANSHIP" of the Contract Clauses, and which are undamaged and unused at time of installation, and which are complete with accessories, trim, finish, safety guards and other devices and details needed for complete installation and for intended use and effect.
1. Standard Products: Products shall be essentially the standard catalogued products of manufacturers regularly engaged in production of such products and shall be the manufacturer's latest standard design that complies with the specification requirements. Equipment shall essentially duplicate items that have been in satisfactory commercial and industrial use at least two years, or more if otherwise specified, prior to bid opening; or in lieu thereof shall have been used and operated in a test installation which, in the opinion of the Contracting Officer, duplicate its field performance for the same period of time. The Contracting Officer reserves the right to require the Contractor to submit evidence to this effect for his approval. When two units of the same class of equipment are required, these units shall be the product of a single manufacturer; however, the component parts of the system need not be the products of the same manufacturer.
 2. Continued Availability: Products which, by nature of their application, are likely to be needed at a later date for maintenance and repair or replacement work, shall be current models for which replacement parts are available.

2.3 LABELS AND NAMEPLATES

- A. General: To the extent feasible and consistent with the following requirements pertaining to the appearance of the finished building, wherever a product is required to comply with a specified standard, grade, class, or type, a permanent label to this effect shall be applied to the product. Where this is not feasible because of the nature of the product, the label shall be on or inside of each container.
- B. Nameplates: Except as otherwise indicated for required approval labels and operating data, do not permanently attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view either in occupied spaces or on exterior of the work.
- C. Labels: Locate required labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface which, in occupied spaces, is not conspicuous.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 016000

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PRODUCT REQUIREMENTS

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AMEC Environment & Infrastructure, Inc.

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Definition: "Cutting and patching" includes cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original condition.
1. Cutting and patching is performed for coordination of the work, to uncover work for access or inspection, to obtain samples for testing, to permit alterations or installation of products and materials, in existing conditions and for other similar purposes.
 2. Cutting and patching performed during the manufacture of products, or during the initial fabrication, is not considered to be "cutting and patching" under this definition. Drilling of holes to install fasteners and similar operations are also not considered to be "cutting and patching".
 3. "Demolition" and "Selective Demolition" are recognized as related-but-separate categories of work, which may or may not require cutting and patching as defined in this section; refer to "Selective Demolition" sections of Division 1.
- B. Refer to other sections of these specifications for specific cutting and patching requirements and limitations applicable to individual units of work.

1.2 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio. Prior to such work, obtain approval of project's structural engineer.
- B. Before cutting and patching the following categories of work, obtain the Contracting Officer's approval to proceed.
1. Structural steel and/or concrete.
 2. Miscellaneous structural metals, including lintels, equipment supports, stair systems and similar categories of work.
 3. Noise and vibration control elements and systems.
- C. Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the adjacent existing surface and shall match the existing adjacent surface texture and finish as closely as possible.

1.3 SUBMITTALS

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- A. Procedural Proposal for Cutting and Patching: Where prior approval of cutting and patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:
1. Describe nature of the work and how it is to be performed, indicating why cutting and patching cannot be avoided. Describe anticipated results of the work in terms of changes to work, including structural, operational and visual changes as well as other significant elements.
 2. List products to be used when work is expected to be performed.
 3. Give dates when work is expected to be performed.
 4. List utilities that will be disturbed or otherwise be affected by work, including those that will be relocated and those that will be out of service temporarily. Include how long utility service will be disrupted.
 5. When cutting, modifying, and patching of structural work is required to facilitate the installation of work required in this contract, notify the Contracting Officer immediately. Do not cut or modify the structural element without written instructions from the Contracting Officer. The Contractor shall follow the Contracting Officer's direction.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Except as otherwise indicated, or as directed by the Contracting Officer, use materials for cutting and patching that are identical to adjacent materials. If identical materials are not available, or cannot be used, use materials that match adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials for cutting and patching that will result in equal-or-better performance characteristics.
1. The use of a trade name and suppliers name and address is to indicate a possible source of the product. Products of the same type from other sources shall not be excluded provided they possess like physical and functional characteristics.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Before cutting, examine the surfaces to be cut and patched and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, notify the Contracting Officer. Corrective action shall be taken before proceeding with the work.

3.2 PREPARATION

- A. Temporary Support: To prevent failure provide temporary support of work to be cut as required.
- B. Protection: Protect other work during cutting and patching to prevent damage. Provide protection from adverse weather conditions of that part of the project that may be exposed during cutting and patching operations.

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1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching work. Except as otherwise indicated or as approved by the Contracting Officer, proceed with cutting and patching at the earliest feasible time and complete work without delay.
- B. Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work. Where possible review proposed procedures with the original installer; comply with original installer's recommendations.
 1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole.
 2. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.
- C. Patching: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.
 1. Where feasible, inspect and test patched areas to demonstrate integrity of work.
 2. Restore exposed finishes of patched areas and where necessary extend finish restoration into retained adjoining work in a manner which will eliminate evidence of patching and refinishing.
 3. Where removal of walls or partitions extends from one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove floor and wall coverings and replace with new materials.
 - a. Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.
 4. Patch or repair existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.4 CLEANING

- A. Thoroughly clean areas and spaces where work is performed or used as access to work. Completely remove paint, mortar, oils, putty and items of similar nature which are not part of the final patch or refinished surface. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied in accordance with other trade sections.

END OF SECTION 017329

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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 WASTE MANAGEMENT GOALS

A. GENERAL WASTE MANAGEMENT GOALS:

1. This Project shall generate the least amount of waste possible.
2. The Contractor shall employ processes which ensure the generation of as little waste as possible and shall avoid the generation of waste due to the following:
 - a. Over-packaging
 - b. Error
 - c. Poor planning, layout
 - d. Over ordering
 - e. Breakage
 - f. Mishandling
 - g. Contamination
 - h. Damage from weather
3. Of the inevitable waste that is generated, as many of the waste materials as economically feasible shall be reused, salvaged, or recycled.
4. Waste disposal in landfills shall be minimized to the greatest extent possible.

B. WASTE DIVERSION GOALS:

1. The following waste categories, at a minimum, shall be diverted from landfill:
 - a. Inerts (concrete, asphalt, masonry)
 - b. Clean dimensional wood, palette wood
 - c. Engineered wood products: Plywood, Particle board, Joists, etc.
 - d. Cardboard, paper, packaging
 - e. Metals from banding, ductwork, framing, piping and repair. Including steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass and bronze.
 - f. Paint
 - g. Plastics: ABS, PVC
 - h. Beverage containers
 - i. Insulation
 - j. Gypsum board

1.2 RELATED SECTIONS

- A. All technical sections.

1.3 DEFINITIONS

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- A. CLASS III LANDFILL: A landfill that accepts non-hazardous resources such as household, commercial, and industrial waste resulting from construction, remodeling, repair, and demolition operations.
- B. CLEAN: Untreated and unpainted; uncontaminated with adhesives, oils, solvents, mastics, and like products.
- C. CONSTRUCTION AND DEMOLITION WASTE: Includes all non-hazardous resources resulting from construction, remodeling, alterations, repair and demolition operations.
- D. DISMANTLE: The process of parting out a building in such a way as to preserve the usefulness of its materials and components.
- E. DISPOSAL: acceptance of solid wastes at a legally operating facility for the purpose of landfilling. Includes Class III landfills and inert fills.
- F. INERT FILL: A facility that can legally accept inert waste such as asphalt and concrete exclusively for the purpose of disposal.
- G. INERT SOLIDS/INERT WASTE: Non-liquid solid resources including, but not limited to, soil and concrete, that does not contain hazardous waste or soluble pollutants at concentrations in excess of water-quality objectives established by a regional Water Board and does not contain significant quantities of decomposable solid resources.
- H. MIXED DEBRIS: Loads that include commingled recyclable and non-recyclable materials generated at the construction site.
- I. MIXED DEBRIS RECYCLING FACILITY: A solid resources processing facility that accepts loads of mixed construction and demolition debris for the purpose of recovering re-usable and recyclable materials and disposing non-recyclable materials.
- J. PERMITTED WASTE HAULER: A company that holds a valid permit from the State of Connecticut to collect and transport solid wastes from individuals or businesses for the purpose of recycling or disposal.
- K. RECYCLING: The process of sorting, cleansing, treating, and reconstituting materials for the purpose of using the altered form in the manufacture of a new product. Recycling does not include burning, incinerating or thermally destroying solid waste.
 - 1. On-site Recycling: Materials that are sorted and processed on site for use in an altered stated in the Work, i.e. concrete crushed for use as a sub-base in paving.
 - 2. Off-site Recycling: Materials hauled to a location and used in an altered form in the manufacture of a new product.
- L. RECYCLING FACILITY: An operation that can legally accept materials for the purpose of processing the materials into an altered form for the manufacture of a new product. Depending on the types of materials accepted and operating procedures, a recycling facility may or may not be required to have a Solid Waste Facilities permit from the City of Harford.
- M. RE-USE: Materials that are recovered for use in the same form, on- or off-site.

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- N. RETURN: To give back reusable items or unused products to vendors for credit.
- O. SALVAGE: To remove waste materials from the site for resale or re-use by a third party.
- P. SOURCE-SEPARATED MATERIALS: Materials that are sorted by type at the Site for the purpose of reuse and recycling.
- Q. SOLID WASTE: Materials that have been designated as non-recyclable and are discarded for the purposes of disposal.
- R. TRANSFER STATION: A facility that can legally accept solid waste for the purpose of temporarily storing the materials for re-loading onto other trucks and transporting them to a landfill for disposal, or recovering some materials for re-use or recycling.

1.4 SUBMITTALS

- A. WASTE MANAGEMENT PLAN:
Prior to any waste removal, the Contractor shall submit to the Contracting Officer a Waste Management Plan. The Plan shall contain the following:
 - 1. Analysis of the estimated job site waste to be generated, including types and quantities. Provide written description method for removal of waste from renovation area to outside of Jetport.
 - 2. Proposed Alternatives to Landfilling: Contractor shall prepare a list of each material proposed to be salvaged, re-used, or recycled during the course of the Project.
 - 3. Methods handling of materials to be recycled
 - a. On site:
 - i. Materials separation
 - ii. Materials storage
 - ii. Materials protection, where applicable.
 - b. Off site: Provide name of mixed debris recycling facility; include list of materials to be recycled.
 - 4. Materials Handling Procedures: A description of the means to be employed in recycling the above materials consistent with requirements for acceptance by designated facilities.
 - 5. Landfill options: The name of the landfill(s) where trash will be disposed of.
 - 6. Meetings: Contractor shall conduct Construction Waste Management meetings. Meetings shall include the Subcontractor, the Contracting Officer and the Building Manager. At a minimum, waste management goals and issues shall be discussed at the following meetings:
 - a. Pre-construction meeting.
 - b. Regular job-site meetings.

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7. Transportation: A description of the means of transportation of the recyclable materials (whether materials will be site-separated and self-hauled to designated centers, or whether mixed materials will be collected by a waste hauler and removed from the site) and destination of materials

B. REPORTS

1. The Contractor shall submit regularly, a Waste Management Progress Report. The report shall contain the following information:
 - a. The amount (in tons or cubic yards) of material landfilled from the Project, the identity of the landfill, the total amount of tipping fees paid at the landfill, and the total disposal cost. Include legible copies of manifests, weight tickets, receipts, and invoices. Manifests shall be from recycles and/or disposal site operators that can legally accept the materials for the purpose of reuse, recycling or disposal.
 - b. For each material recycled, reused, or salvaged from the Project, provide the following:
 - i. Amount (in tons or cubic yards)
 - ii. Date removed from the job site
 - iii. Receiving party

1.5 QUALITY ASSURANCE

- A. Comply with EPA Executive Order 12873, 1993.

PART 2 - PRODUCTS: Not Used

PART 3 - EXECUTION: Not Used

END OF SECTION 07419

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CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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AMEC Environment & Infrastructure, Inc.

SECTION 017700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. General: This section includes general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of contract, occupancy and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Division 02 through 33. Time of closeout is directly related to "Substantial Completion", and therefore may be either a single time period for entire work or a series of time periods for individual parts of the work which have been noted as substantially complete at different dates.

1.2 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. General: Prior to requesting inspection for certification of substantial completion (for either entire work or portions thereof), complete the following and list known exceptions in request:
1. In progress payment request, coincident with or first following date claimed, show either 100% completion for portion of work claimed as "substantially complete", or list incomplete items, value of incompleteness, and reasons for being incomplete. Include supporting documentation for completion as indicated in these contract documents.
- B. Inspection Procedures: Upon receipt of Contractor's request, the Contracting Officer will either proceed with inspection or advise Contractor of prerequisites not fulfilled. Following initial inspection, the Contracting Officer will note substantial completion, or advise Contractor of work which must be performed and repeat inspection when requested and assured that work has been substantially completed. Results of completed inspection will form initial "punch-list" for final acceptance.

1.3 PREREQUISITES TO FINAL ACCEPTANCE

- A. General: Prior to requesting final inspection for certification of final acceptance and final payment, as required by Contract Clauses, complete the following and list known exceptions (if any) in request:
1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted.
 2. Submit copy of final punch-list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance.
 3. Submit specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents.
 4. Submit record as built drawings, final project photographs, property survey, and similar final record information.
 5. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Government.
 6. Make final change-over of locks and transmit keys to the Government Representative and advise Government personnel of change-over in security provisions.
 7. Complete final cleaning up requirements, including touch-up painting of marred surfaces.
 8. Touch-up and otherwise repair and restore marred exposed finishes.

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- B. Re-inspection Procedure: Upon receipt of Contractor's notice that the work has been completed, including punch-list items resulting from earlier inspections, and excepting incomplete items delayed because of acceptable circumstances, the Government Representative will re-inspect the work. If necessary, procedure will be repeated.
- C. Upon completion of re-inspection of the final spaces to be turned over the Government, the Government Representative will either prepare certificate of final acceptance or advise Contractor of work not completed or obligations not fulfilled as required for final acceptance.

1.4 RECORD DOCUMENT SUBMITTALS

- A. General: As work progresses, prepare and maintain record documents as specified herein. Each record shall be certified by the Contractor and the Government Representative. Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location accessible to the Contracting Officer for reference during normal working hours. Upon completion, turn record documents over to the Contracting Officer as specified in the "Document Security Notice". Follow all procedures contained therein for document disposal.
- B. Record Drawings: Maintain a white-print set (blue-line or black-line) of contract drawings (including amendment and change order drawings) and shop drawings in clean, undamaged condition, with mark-up of actual installations which vary from the work as originally shown.
 - 1. Mark whichever drawing is most capable of showing "field" condition fully and accurately; r,
 - 2. Where shop drawings are used for mark-up, record a cross-reference at corresponding location on working drawings.
 - 3. Mark with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work.
 - 4. Mark-up new information which is recognized to be of importance, but was for some reason not shown on either contract drawings or shop drawings. Give particular attention to concealed work, which would be difficult to measure and record at a later date.
 - 5. Note related change order numbers where applicable.
 - 6. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on cover of each set.
- C. Record Specifications: Maintain one copy of complete specifications, including amendments, change orders and similar modifications issued in printed form during construction, and mark-up variations in actual work in comparison with text of specifications and modifications as issued. Give particular attention to substitutions, selection of options, and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.
- D. Progress and Final Photographs: For each building or structure under contract, provide the following:
 - 1. All photography for the project shall be performed with a digital camera. GSA shall receive electronic copies of all photos within 5 days of the time they are taken. At the completion of the project, a CD of all photos shall be delivered to GSA.
 - 2. At the completion of the project, photos shall be taken to illustrate the entire area of work as well as adjacent areas/materials.
 - 3. At least 1 shot daily of each scope of work item shall be produced with such artistic skill as to be suitable, in the Contracting Officer's opinion, for exhibition and reproduction.

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4. If progress photographs are not furnished within five days of the date when due or within five days after demand, the Contracting Officer will cause such photographs to be taken and the cost will be charged to the Contractor. Furnish photographs as soon as possible under the specified light conditions.
- E. Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record-keeping and submittals in connection with actual performance of the work. Immediately prior to date(s) of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Turn over to the Contracting Officer prior to final acceptance.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. Comply with manufacturer's instructions for cleaning operation. The following is required in addition to special cleaning specified in technical sections.
 1. Remove labels which are not required as permanent labels.
 2. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances which are noticeable as vision obscuring materials. Replace broken glass and damaged transparent materials.
 3. Wipe surfaces of equipment clean. Remove excess lubrication and other substances.
 4. Remove debris and surface dust from limited-access spaces.
 5. Clean light fixtures and lamps so as to function with full efficiency.
 6. Clean project site of litter and foreign substances. Sweep paved areas to a broom-clean condition; remove stains, petrochemical spills and other foreign deposits. Rake grounds which are neither planted nor paved, to a smooth, even-textured surface.
 7. And all other ITEMS/AREAS as directed by the Government Representative
- B. Removal of Protection: Except as otherwise indicated or requested by the Contracting Officer, remove temporary protection devices and facilities which were installed during course of the work to protect previously completed work during remainder of construction period.
- C. Completion of contract: The Contractor shall notify the Contracting Officer, in writing, when all work and services required under this contract are complete.

END OF SECTION 017700

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SECTION 017823 - 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. Operation manuals for systems, subsystems, and equipment.
 - 2. Maintenance manuals for the care and maintenance of products, materials, and finishes.
- B. See Divisions 2 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.
- C. Organize Manuals into suitable volumes of manageable size, as approved by the Government Representative.

1.2 SUBMITTALS

- A. Manual: Submit PDF copies of each manual in final form at least 15 days before final inspection. The Government Representative will return copy with comments within 15 days after final inspection.
 - 1. Correct or modify each manual to comply with the Government Representative's comments. Submit PDFs of each corrected manual within 15 days of receipt of Government Representative's comments.
 - 2. After acceptance of the manual submit a CD of the manual to the Government, clearly identifying the contents of the CD.

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: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project/Agency.
 - 3. Name and address of Contracting Officer.
 - 4. Date of submittal.
 - 5. Name, address, and telephone number of Contractor.
 - 6. Name and address of Architect/Engineer.
 - 7. Cross-reference to related systems in other operation and maintenance manuals.

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- 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 in a single PDF.

2.2 OPERATION MANUALS

- A. 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.
- B. Descriptions: Include the following:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. 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.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

2.3 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 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.

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- D. 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.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. 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.
- C. 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.

3.2 INSTRUCTIONS TO MAINTENANCE PERSONNEL

- A. Where instructions to maintenance personnel are specified in other sections, furnish without additional expense to the Government, the services of competent instructors who will give full instruction in the care, adjustment, and operation of the systems and equipment to designated maintenance personnel
- B. Each instructor shall be familiar with all parts and systems on which he is to give instruction and shall be trained in operating theory as well as in practical operation and maintenance work. Employ factory trained instructors wherever practical and available.
- C. Unless otherwise required or approved, give instruction during the regular work week after the equipment has been accepted and turned over to the Government for regular operation. Where significant changes or modifications in equipment are made under terms of the guarantee, provide additional instruction as may be necessary to acquaint the operating personnel of the changes or modifications. Where more than four man-days (32 hours) of instruction are specified, approximately half of the time shall be classroom instruction and the other half with the equipment or system.
- D. Utilize the maintenance manual for the system or equipment as a text for the instruction. Instruction shall include a review of the maintenance manual.

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- E. Upon completion, obtain written acknowledgement from the Contracting Officer that the required instruction was completed.

3.3 POSTED OPERATING INSTRUCTIONS

- A. Post operating instructions approved by the Government Representative for each system and each principal piece of equipment for the use of operation and maintenance personnel. Include wiring and control diagrams showing the complete layout of the entire system including equipment, piping and valves and control sequence, framed under glass or approved laminated plastic and posted where directed by the Government Representative. Printed or engraved operating instructions for each principal piece of equipment including start-up, proper adjustment, operating, lubrication, shut-down, safety precautions, procedure in the event of equipment failure and any other necessary items of instruction recommended by the manufacturer of the unit shall be attached to or posted adjacent to the piece of equipment. Operating instructions exposed to the weather shall be made of weather resisting materials or shall be suitably enclosed to be weather protected. Operating instructions shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

END OF SECTION 017823

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SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Demolition and removal of selected portions of building or structure.
- B. Related Sections include the following:
 - 1. Division 01 Section "Summary" for use of premises and Owner-occupancy requirements.
 - 2. Division 01 Section "Project Management and Coordination" for use of premises and daily Owner-occupancy requirements.
 - 3. Division 01 Section "Temporary Facilities and Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 4. Division 01 Section "Cutting and Patching" for cutting and patching procedures.
 - 5. Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

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- C. Standards: Comply with ANSI A10.6 and NFPA 241.
- D. Predemolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

- A. Owner will occupy building during selective demolition. Conduct selective demolition so Owner's operations will not be disrupted.
 - 1. Comply with requirements specified in Division 01 Section "Summary."
- B. Hazardous Materials: Hazardous materials are present in construction to be selectively demolished.
 - 1. Hazardous material remediation is specified elsewhere in the Contract Documents.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
- C. Storage or sale of removed items or materials on-site is not permitted.
- D. 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.

1.6 WARRANTY

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Contracting Officer.

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- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
 - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Government will arrange to shut off indicated services/systems when requested by Contractor.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
- B. Temporary Facilities: 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. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 3. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in specification sections "Asbestos Removal" and "Lead Paint Removal".

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. 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

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- or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Dispose of demolished items and materials promptly.

B. Removed and Reinstalled Items:

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

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted, items may be removed to a suitable, protected storage location during selective demolition, cleaned, and reinstalled in their original locations after selective demolition operations are complete.

D. PCB Light Fixtures - All light ballasts that do not have a clear "NO PCB's" label on them are to be considered PCB containing and if are to be removed, disposed of as PCB containing material. All bulbs are to be packaged and disposed as a mercury (Hg) containing waste, if they are to be removed.

1. Review with Contracting Officer the quantity and location of all suspect light fixtures and proceed based on direction received.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Dispose of all materials containing asbestos and lead paint as directed in the specification sections "Asbestos Removal" and "Lead Paint Removal". Items or materials indicated to be reinstalled or otherwise indicated are to remain Owner's property. Remove demolished materials daily from Project site and legally dispose of them.

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.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

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- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 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 024119

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SELECTIVE STRUCTURE DEMOLITION

024119 - 5

AMEC Environment & Infrastructure, Inc.

SECTION 061000 - 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. This Section includes the following:

- 1. Wood blocking and nailers.
- 2. Plywood backing panels.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. RIS: Redwood Inspection Service.
 - 4. SPIB: The Southern Pine Inspection Bureau.
 - 5. WCLIB: West Coast Lumber Inspection Bureau.
 - 6. WWPAA: Western Wood Products Association.

PART 2 - PRODUCTS

2.1 FIRE-RETARDANT-TREATED MATERIALS

- A. General: Comply with performance requirements in AWPA C27 (plywood).
 - 1. Use Interior Type A, unless otherwise indicated.
- B. Application: Treat items indicated on Drawings, and the following:
 - 1. Plywood backing panels.

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2.2 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
- B. 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.
- C. 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.
- D. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.3 PLYWOOD BACKING PANELS

- A. Telephone and Electrical Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 1/2-inch nominal thickness.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not splice structural members between supports, unless otherwise indicated.
- B. 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.
- C. 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. 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. 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.

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3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

END OF SECTION 061000

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SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Plastic-laminate cabinets.
 - 2. Plastic-laminate countertops.
- B. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips unless concealed within other construction before woodwork installation.

1.2 SUBMITTALS

- A. Product Data: For cabinet hardware and accessories and finishing materials and processes.
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
 - 1. Plastic-laminates, for each type, color, pattern, and surface finish.
- D. Sustainable Submittals:
 - 1. Product Data:
 - a. For each composite-wood product used, documentation indicating that the bonding agent contains no urea formaldehyde.
 - b. For each adhesive used, documentation indicating that the adhesive contains no urea formaldehyde.
 - 2. Certificates: Chain-of-custody certificates certifying that products specified to be made from certified wood comply with forest certification requirements. Include evidence that mill is certified for chain of custody by an FSC-accredited certification body.
 - a. Include statement indicating costs for each certified wood product.
- E. Woodwork Quality Standard Compliance Certificates: AWI Quality Certification Program certificates.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of woodwork.

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- B. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards."
 - 1. Provide AWI Quality Certification Program labels and certificates for woodwork, including installation.
- C. Forest Certification: Provide interior architectural woodwork 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."

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

- A. Fabricators: Subject to compliance with requirements, provide interior architectural woodwork by one of the following:

2.2 MATERIALS

- A. Wood Products:
 - 1. Hardboard: AHA A135.4.
 - 2. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, made with adhesive containing no urea formaldehyde.
- B. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural woodwork, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."
- B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
 - 1. Semiconcealed Hinges for Flush Doors: BHMA A156.9, B01361.
 - 2. Semiconcealed Hinges for Overlay Doors: BHMA A156.9, B01521.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.

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- D. Catches: Ball friction catches, BHMA A156.9, B03013.
- E. Drawer Slides: BHMA A156.9, B05091.
 - 1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
- F. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
 - 1. Satin Stainless Steel: BHMA 630.

2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln-dried to less than 15 percent moisture content.
- B. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

2.5 FABRICATION

- A. General: Complete fabrication to maximum extent possible before shipment to Project site. Where necessary for fitting at site, provide allowance for scribing, trimming, and fitting.
 - 1. Interior Woodwork Grade - AWI: Premium.
 - 2. Shop cut openings to maximum extent possible. Sand edges of cutouts to remove splinters and burrs. Seal edges of openings in countertops with a coat of varnish.
 - 3. Panel-Matching Method: No matching between panels is required. Select and arrange panels for similarity of grain pattern and color between adjacent panels.
- B. Plastic-Laminate Cabinets:
 - 1. AWI Type of Cabinet Construction: Flush overlay.
 - 2. Reveal Dimension: 1/2 inch.
 - 3. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate as follows:
 - a. Horizontal Surfaces Other Than Tops: Grade HGS.
 - b. Postformed Surfaces: Grade HGP.
 - c. Vertical Surfaces: Grade HGS.
 - d. Edges: PVC tape, 0.018-inch minimum thickness, matching laminate in color, pattern, and finish.
 - 4. Materials for Semiexposed Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
 - 5. Drawer Sides and Backs: Solid-hardwood lumber.
 - 6. Drawer Bottoms: Hardwood plywood.
 - 7. Colors, Patterns, and Finishes: As selected by Contracting Officer from laminate manufacturer's full range.

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8. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.
- C. Plastic-Laminate Countertops:
1. High-Pressure Decorative Laminate Grade: HGS.
 2. Colors, Patterns, and Finishes: As selected by Contracting Officer from laminate manufacturer's full range.
 3. Edge Treatment: Same as laminate cladding on horizontal surfaces.
 4. Core Material at Sinks: exterior-grade plywood.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas. Examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.
- B. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for fabrication of type of woodwork involved.
- C. Install woodwork level, plumb, true, and straight to a tolerance of 1/8 inch in 96 inches. Shim as required with concealed shims.
- D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.
- F. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation.
 1. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.
- G. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop. Calk space between backsplash and wall with sealant specified in Division 07 Section "Joint Sealants."

END OF SECTION 064023

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SECTION 079200 - 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. Latex joint sealants.
- B. Related Sections:
 - 1. Division 09 Section "Gypsum Board" for sealing perimeter joints.
 - 2. Division 09 Section "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
 - 1. For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.
- B. Samples: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. 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.
- D. Qualification Data: For qualified Installer and testing agency.
- E. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- F. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

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1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
 - 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.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors of Exposed Joint Sealants: As selected by Contracting Officer from manufacturer's full range.

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2.2 SILICONE JOINT SEALANTS

- A. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Pecora Corporation; 898.

2.3 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. Pecora Corporation; AC-20+.
 - d. Tremco Incorporated; Tremflex 834.

2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin), Type O (open-cell material), Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, 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.

2.5 MISCELLANEOUS MATERIALS

- A. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

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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 joint-sealant performance.
- 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 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.
- 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. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.

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2. Do not stretch, twist, puncture, or tear sealant backings.
 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install 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.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 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.

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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:
 - a. Vertical joints on exposed surfaces of walls and partitions.
 - b. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
 - c. Other joints as required.

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2. Joint Sealant: Latex.
 3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range of colors.
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Other joints as required.
 2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
 3. Joint-Sealant Color: As selected by Contracting Officer from manufacturer's full range of colors.

END OF SECTION 079200

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SECTION 081113 – 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Standard hollow metal doors and frames.
- B. Related Sections
 - 1. Division 8 Section "Door Hardware" for door hardware for hollow metal doors.
 - 2. Division 9 Sections "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings.
- B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.
- C. Custom Hollow Metal Work: Hollow metal work fabricated according to ANSI/NAAMM-HMMA 861.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door design.
 - 2. Details of doors, including vertical and horizontal edge details and metal thickness.
 - 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 conduit and preparations for power, signal, and control systems.
- C. Other Action Submittals:

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1. 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 door hardware schedule.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
 1. Provide additional protection to prevent damage to finish of factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs.
- C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Do not store in a manner that traps excess humidity.
 1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

- A. Coordinate installation of anchorages 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.

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. Amweld Building Products, LLC.
 2. Ceco Door Products; an Assa Abloy Group company.
 3. Fleming Door Products Ltd.; an Assa Abloy Group company.
 4. Kewanee Corporation (The).
 5. Pioneer Industries, Inc.

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6. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z 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.
- C. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- D. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-development indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.3 STANDARD HOLLOW METAL DOORS

- A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.
- B. Interior Doors: Face sheets fabricated from cold-rolled steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:
 1. Level 1 and Physical Performance Level C (Standard Duty), Model 1 (Full Flush).
 - a. Width: As indicated on Drawings.
- C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.
- D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

- A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.
- B. Interior Frames: Fabricated from cold-rolled steel sheet.
 1. Fabricate frames with mitered or coped corners.
 2. Fabricate frames as welded in place, unless otherwise indicated.

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3. Frames for Wood Doors: 16 GA.

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

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.

B. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick, and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 ACCESSORIES

A. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch- wide steel.

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 thickness of metal. 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. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/NAAMM-HMMA 861.

C. 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 ratings indicated.

3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.

4. Top Edge Closures: Close top edges of doors with inverted closures 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.

D. 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.

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1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
 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 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 - 5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.
 5. Door Silencers: 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.
- E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.
- F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 8 Section "Door Hardware."
1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
 2. Reinforce frames to receive nontemplated, mortised and surface-mounted door hardware.
 3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
 4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 16 Sections.
- 2.8 STEEL FINISHES
- A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.
1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

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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. For the record, 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. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:
 - 1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - 2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - 3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - 4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.
- C. Drill and tap 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 of size and profile indicated. Comply with ANSI/SDI A250.11.
 - 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.

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- a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - b. Install door silencers in frames before grouting.
 - c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - d. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
- a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
4. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.
6. 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 Standard Steel Doors:
 - a. Jambs and Heads: 1/8 inch plus or minus 1/16 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
 - c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
 - d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

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.

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- B. 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.
- C. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 08113

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SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Solid-core doors.
 - 2. Factory finishing flush wood doors.
- B. Related Sections:
 - 1. Division 8 Section "Door Hardware".
 - 2. Division 8 Section "Hollow Metal Doors and Frames."

1.3 SUBMITTALS

- A. Product Data: For each type of door indicated. Include details of core and edge construction and trim for openings. Include factory-finishing specifications.
- B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.
 - 1. Indicate dimensions and locations of mortises and holes for hardware.
 - 2. Indicate dimensions and locations of cutouts.
 - 3. Indicate requirements for veneer matching.
 - 4. Indicate doors to be factory finished and finish requirements.
 - 5. Indicate fire-protection ratings for fire-rated doors.
- C. Samples:
 - 1. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
 - a. Provide samples for each species of veneer and solid lumber required.
 - b. Finish veneer-faced door samples with same materials proposed for factory-finished doors.
- D. Warranty: Sample of special warranty.

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1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.
- B. Source Limitations: Obtain flush wood doors from single manufacturer.
- C. Quality Standard: In addition to requirements specified, comply with AWT's "Architectural Woodwork Quality Standards Illustrated."
- D. Forest Certification: Provide doors made with all wood products obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of referenced standard and manufacturer's written instructions.
- B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
- C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
 - 3. Warranty Period for Solid-Core Interior Doors: Life of installation.

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PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
 2. Ampco, Inc.
 3. Eagle Plywood & Door Manufacturing, Inc.
 4. Marlite.
 5. Marshfield Door Systems, Inc.
 6. Mohawk Flush Doors, Inc.; a Masonite company.

2.2 DOOR CONSTRUCTION, GENERAL

- A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.
- B. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.
- C. Interior Solid-Core Doors:
1. Grade: Architectural, with Grade AA faces.
 2. Species: Red Oak.
 3. Cut: To match existing doors.
 4. Match between Veneer Leaves: Pleasing match.
 5. Assembly of Veneer Leaves on Door Faces: Running match.
 6. Room Match: Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 20 feet or more.
 7. Room Match: Provide door faces of compatible color and grain within each separate room or area of building.
 8. Transom Match: Continuous match.
 9. Exposed Vertical and Top Edges: Same species as faces or a compatible species.
 10. Core: Either glued wood stave or structural composite lumber.
 11. Construction: Five plies, either bonded or nonbonded construction. Rabbet Top required for corridor door only.
 12. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.3 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with requirements in NFPA 80 for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

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1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.

2.4 FACTORY FINISHING

- A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on bottom edges, edges of cutouts, and mortises.
- B. Finish doors at factory that are indicated to receive transparent finish. Field finish doors indicated to receive opaque finish.
- C. Transparent Finish:
 1. Grade: Premium.
 2. Finish: WDMA TR-6 catalyzed polyurethane.
 3. Staining: As selected by Contracting Officer from manufacturer's full range.
 4. Effect: Open-grain finish.
 5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and installed door frames before hanging doors.
 1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
 2. Reject doors with defects.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Hardware: For installation, see Division 8 Section "Door Hardware."
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.
- C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.

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1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.

D. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

E. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

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SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Commercial door hardware for the following:
 - a. Swinging doors.
 - b. Other doors to the extent indicated.
 - 2. Cylinders for doors specified in other Sections.
- B. Related Sections include the following:
 - 1. Division 8 Section "Hollow Metal Doors and Frames."
 - 2. Division 8 Section "Flush Wood Doors."

1.3 SUBMITTALS

- A. Product Data: Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Samples for Verification: Submit minimum 2-by-4-inch plate Samples of each type of finish required, except primed finish.
- C. Maintenance Data: For each type of door hardware to include in maintenance manuals. Include final hardware and keying schedule.
- D. Warranty: Special warranty specified in this Section.
- E. Other Action Submittals:
 - 1. Door Hardware Sets: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final door hardware sets with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

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- a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
 - b. Content: Include the following information:
 - 1) Identification number, location, hand, fire rating, and material of each door and frame.
 - 2) Type, style, function, size, quantity, and finish of each door hardware item. Include description and function of each lockset and exit device.
 - 3) Complete designations of every item required for each door or opening including name and manufacturer.
 - 4) Fastenings and other pertinent information.
 - 5) Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
 - 6) Explanation of abbreviations, symbols, and codes contained in schedule.
 - 7) Mounting locations for door hardware.
 - 8) Door and frame sizes and materials.
 - 9) List of related door devices specified in other Sections for each door and frame.
 - c. Submittal Sequence: Submit the final door hardware sets at earliest possible date, particularly where approval of the door hardware sets must precede fabrication of other work that is critical in Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the door hardware sets.
2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by lock manufacturer.
 1. Installer's responsibilities include supplying and installing door hardware and providing a qualified Architectural Hardware Consultant available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
- B. Architectural Hardware Consultant Qualifications: A person who is currently certified by DHI as an Architectural Hardware Consultant and who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project.
- C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.
- D. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspection agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.
- E. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." In addition to Owner, Contractor, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate

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keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:

1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Preliminary key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

1.5 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 related to the final door hardware sets, and include basic installation instructions, templates, and necessary fasteners with each item or package.
- C. Deliver keys and permanent cores to Owner by registered mail or overnight package service or in person.

1.6 COORDINATION

- A. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. 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 new 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 for proper operation.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which 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 operators 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, except as follows:
 - a. Electromagnetic Locks: Five years from date of Substantial Completion.
 - b. Manual Closers: 10 years from date of Substantial Completion.
 - c. Exit Devices: Two years from date of Substantial Completion.

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1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in this Section and door hardware sets indicated in Part 3 "Door Hardware Sets" Article.
1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products.
 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
- B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in this Section. Products are identified by using door hardware designations, as follows:
1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements.
- C. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Available Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 HINGES, GENERAL

- A. Quantity: Provide the following, unless otherwise indicated:
1. Two Hinges: For doors with heights up to 60 inches.
 2. Three Hinges: For doors with heights 61 to 90 inches.
 3. Four Hinges: For doors with heights 91 to 120 inches.
- B. Template Requirements: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.
- C. Hinge Weight: Unless otherwise indicated, provide the following:
1. Doors with Closers: Antifriction-bearing hinges.
 2. Interior Doors: Heavy-weight hinges.
- D. Hinge Base Metal: Unless otherwise indicated, provide the following:

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1. Interior Hinges: Stainless steel, with stainless-steel pin.
2. Hinges for Fire-Rated Assemblies: Stainless steel, with stainless-steel pin.

E. Hinge Options: Where indicated in door hardware sets or on Drawings:

1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all public access doors with locks.
2. Corners: To match existing door hinges.
3. 180 Degree hinge.

F. Fasteners: Comply with the following:

1. Machine Screws: For metal frames. Install into drilled and tapped holes.
2. Wood Screws: For wood doors.
3. Threaded-to-the-Head Wood Screws: For fire-rated wood doors.
4. Screws: Phillips flat-head; wood screws for wood doors and frames. Finish screw heads to match surface of hinges.

2.3 HINGES

A. Butts and Hinges: BHMA A156.1. Listed under Category A in BHMA's "Certified Product Directory."

B. Template Hinge Dimensions: BHMA A156.7.

C. Available Manufacturers:

1. Baldwin Hardware Corporation (BH).
2. Bommer Industries, Inc. (BI).
3. Cal-Royal Products, Inc. (CCRP).
4. Hagar Companies (HAG).
5. Lawrence Brothers, Inc. (LB).
6. McKinney Products company; an ASSA ABLOY Group Company (MCK).
7. PBB, Inc. (PBB).
8. Stanley commercial hardware; Div. of the Stanley Works (STW).

2.4 LOCKS AND LATCHES, GENERAL

A. Accessibility Requirements: Comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." and FED-STD-795, "Uniform Federal Accessibility Standards."

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.

B. Latches and Locks for Means of Egress Doors: Comply with NFPA 101. Latches shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.

C. Lock Trim:

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1. Levers: Cast.
 2. Escutcheons (Roses): Wrought.
 3. Dummy Trim: Match lever lock trim and escutcheons.
- D. Lock Throw: Comply with testing requirements for length of bolts required for labeled fire doors, and as follows:
1. Bored Locks: Minimum 1/2-inch latchbolt throw.
 2. Mortise Locks: Minimum 3/4-inch latchbolt throw.
 3. Deadbolts: Minimum 1-inch bolt throw.
- E. Backset: 2-3/4 inches, unless otherwise indicated.
- F. Strikes: Manufacturer's standard strike with strike box for each latchbolt or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, and as follows:
1. Strikes for Bored Locks and Latches: BHMA A156.2.
 2. Strikes for Mortise Locks and Latches: BHMA A156.13.
 3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
 4. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
 5. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
 6. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.

2.5 MECHANICAL LOCKS AND LATCHES

- A. Lock Functions: Function numbers and descriptions indicated in door hardware sets comply with the following:
1. Bored Locks: BHMA A156.2.
 2. Mortise Locks: BHMA A156.13.
- B. Bored Locks: BHMA A156.2, Grade 1.
1. Provide product indicated in Part 3 "Door Hardware Sets" by the following manufacturer:
 - a. Marks USA.
- C. Mortise Locks: Stamped steel case with steel or brass parts; BHMA A156.13, Grade 1.
1. Provide product indicated in Part 3 "Door Hardware Sets" by the following manufacturer:
 - a. Marks USA.

2.6 ELECTRIC STRIKES

- A. Electric Strikes: BHMA A156.31; Grade 1; with faceplate to suit lock and frame.
1. Available Manufacturers:

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- a. Adams Rite Manufacturing Co.; an ASSA ABLOY Group Company.
- b. Dortronics Systems, Inc.
- c. DynaLock Corp.
- d. Folger Adam Electric Door Controls; an ASSA ABLOY Group Company.
- e. HES, Inc.; an ASSA ABLOY Group Company.
- f. Rutherford Controls Int'l. Corp.
- g. Security Door Controls.
- h. Trine Access Technology.
- i. Von Duprin; an Ingersoll-Rand company.

2.7 EXIT DEVICES

- A. Exit Devices: BHMA A156.3, Grade 1.
- B. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." and FED-STD-795, "Uniform Federal Accessibility Standards."
 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
- C. Exit Devices for Means of Egress Doors: Comply with NFPA 101. Exit devices shall not require more than 15 lbf to release the latch. Locks shall not require use of a key, tool, or special knowledge for operation.
- D. Panic Exit Devices: Listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Fire Exit Devices: Devices complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire and panic protection, based on testing according to UL 305 and NFPA 252.
- F. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
 1. Operation: Rigid.
- G. Available Manufacturers:
 1. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company (CR).
 2. Precision Hardware, Inc. (PH).
 3. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 4. Yale Commercial Locks and Hardware; an ASSA ABLOY Group company (YAL).

2.8 LOCK CYLINDERS

- A. Standard Lock Cylinders: BHMA A156.5, Grade 1.

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- B. Cylinders: Manufacturer's standard tumbler type, constructed from brass or bronze, stainless steel, or nickel silver, and complying with the following:
 - 1. Number of Pins: Six.
 - 2. Mortise Type: Threaded cylinders with rings and straight- or clover-type cam.
 - 3. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 - 4. Bored-Lock Type: Cylinders with tailpieces to suit locks.
 - a. High-Security Grade: BHMA A156.5, Grade 1A, listed and labeled as complying with pick- and drill-resistant testing requirements in UL 437 (Suffix A).
- C. Permanent Cores: Manufacturer's standard; finish face to match lockset; complying with the following:
 - 1. Removable Cores: Core insert, removable by use of a special key; for use only with core manufacturer's cylinder and door hardware.
- D. Construction Keying: Comply with the following:
 - 1. Construction Master Keys: Provide cylinders with feature that permits voiding of construction keys without cylinder removal. Provide 10 construction master keys.
 - 2. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.
 - a. Replace construction cores with permanent cores as directed by Contracting Officer.
 - b. Furnish permanent cores to Owner for installation.
- E. Manufacturer: Medeco Security Locks, Inc; an ASSA ABLOY Group Company.
 - 1. Provide product indicated in Part 3 "Door Hardware Sets."

2.9 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference, and as follows:
 - 1. Existing System: Master key or grand master key locks to Owner's existing system.
 - 2. Key Pyramid:
 - a. Building Master Key – Open all doors in the building.
 - b. Tenant Sub-Master – Open all doors in tenant space only.
 - c. Individual Keys – Open each individual's office.
 - 3. (Entry into Tenant space) Doors must be keyed alike and be on the Building Master and Sub-Master.
 - 4. (Private Offices) Doors are to be keyed individually and be on the Tenant Sub-Master. Provide two keys for each door.
- B. Keys: Nickel silver.

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1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
 - a. Notation: Information to be furnished by Contracting Officer.
2. Quantity: In addition to one extra key blank for each lock, provide the following:
 - a. Cylinder Change Keys: Three.
 - b. Master Keys: Five.
 - c. Grand Master Keys: Five.
 - d. Great-Grand Master Keys: Five.

2.10 OPERATING TRIM

- A. Standard: BHMA A156.6.
- B. Materials: Fabricate from brass or stainless steel, unless otherwise indicated.
- C. Available Manufacturers:
 1. Burns Manufacturing Incorporated (BM).
 2. Don-Jo Mfg., Inc. (DJO).
 3. Forms + Surfaces (FS).
 4. Hager Companies (HAG).
 5. Hiawatha, Inc. (HIA).
 6. IVES Hardware; an Ingersoll-Rand Company (IVS).
 7. Rockwood Manufacturing Company (RM).
 8. Trimco (TBM).

2.11 CLOSERS

- A. Accessibility Requirements: Where handles, pulls, latches, locks, and other operating devices are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)." and FED-STD-795, "Uniform Federal Accessibility Standards."
 1. Comply with the following maximum opening-force requirements:
 - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
- B. Door Closers for Means of Egress Doors: Comply with NFPA 101. Door closers shall not require more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
- C. Size of Units: Unless otherwise indicated, comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
- D. Surface Closers: BHMA A156.4, Grade 1.

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1. Provide the following product or equal:
 - a. LCN Closers; an Ingersoll-Rand Company (LCN); 4040 Series, unless otherwise noted in Hardware Sets.

E. Coordinators: BHMA A156.3.

2.12 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

B. Door Bottom Gasketing: Surface mounted or semi-mortised automatic door bottom.

1. Available Manufacturers:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
 - d. Reese Enterprises, Inc.
 - e. Sealeze; a unit of Jason Incorporated.
 - f. Zero International.

2.13 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

1. Available Manufacturers:
 - a. Hager Companies.
 - b. National Guard Products.
 - c. Pemko Manufacturing Co.; an ASSA ABLOY Group Company.
 - d. Reese Enterprises, Inc.
 - e. Sealeze; a unit of Jason Incorporated.
 - f. Zero International.

2.14 PROTECTIVE TRIM UNITS

A. Size: 1-1/2 inches less than door width on push side and 1/2 inch less than door width on pull side, by height specified in door hardware sets.

B. Fasteners: Manufacturer's standard machine or self-tapping screws.

C. Metal Protective Trim Units: BHMA A156.6; beveled top and 2 sides; fabricated from the following material:

1. Material: 0.050-inch- thick stainless steel.

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2. Available Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Burns Manufacturing Incorporated (BM).
 - c. Don-Jo Mfg., Inc. (DJO).
 - d. Hager Companies (HAG).
 - e. IPC Door and Wall Protection Systems, Inc.; Div. of InPro Corporation (IPC).
 - f. IVES Hardware; an Ingersoll-Rand Company (IVS).
 - g. Rockwood Manufacturing Company (RM).
 - h. Trimco (TBM).

2.15 STOPS

- A. Stops and Bumpers: BHMA A156.16, Grade 1.
 1. Provide floor stops for doors unless wall or other type stops are scheduled or indicated. Do not mount floor stops where they will impede traffic. Where floor stops are not appropriate, provide wall stops.
- B. Combination Floor and Wall Stops and Holders: BHMA A156.8, Grade 1.
- C. Silencers for Metal Door Frames: BHMA A156.16, Grade 1; neoprene or rubber, minimum diameter 1/2 inch; fabricated for drilled-in application to frame.
- D. Available Manufacturers:
 1. Architectural Builders Hardware Mfg., Inc. (ABH).
 2. Baldwin Hardware Corporation (BH).
 3. Glynn-Johnson; an Ingersoll-Rand Company (GJ).
 4. IVES Hardware; an Ingersoll-Rand Company (IVS).
 5. SARGENT Manufacturing Company; an ASSA ABLOY Group company (SGT).
 6. Stanley Commercial Hardware; Div. of The Stanley Works (STH).

2.16 MISCELLANEOUS DOOR HARDWARE

- A. Boxed Power Supplies: Modular unit in NEMA ICS 6, Type 4 enclosure; filtered and regulated; voltage rating and type matching requirements of door hardware served; and listed and labeled for use with fire alarm systems.
- B. Auxiliary Hardware: BHMA A156.16, Grade 1.
 1. Available Manufacturers:
 - a. Baldwin Hardware Corporation (BH).
 - b. Cal-Royal Products, Inc. (CRP).
 - c. Don-Jo Mfg., Inc. (DJO).
 - d. Hager Companies (HAG).
 - e. Lawrence Brothers, Inc. (LB).
 - f. Rockwood Manufacturing Company (RM).

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- g. Stanley Commercial Hardware; Div. of The Stanley Works (STH).
- h. Trimco (TBM).

C. Hinge Filler Plate

- 1. 10 GA minimum with finish to match frame.

D. Strike Cutout Filler Plate

- 1. 10 GA minimum with finish to match frame.

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-rated labels and as otherwise approved by Contracting Officer.

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

B. Base Metals: Produce door hardware units of base metal, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18. Do not furnish manufacturer's standard materials or forming methods if different from specified standard.

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

- 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
- 2. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

2.18 FINISHES

A. Standard: BHMA A156.18, 26D Satin Chromium Finish unless indicated otherwise.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Steel Doors and Frames: Comply with DHI A115 Series.
 - 1. Surface-Applied Door Hardware: Drill and tap doors and frames according to ANSI A250.6.
- B. Wood Doors: Comply with DHI A115-W Series.

3.3 INSTALLATION

- A. Mounting Heights: Mount door hardware units at heights indicated as follows unless otherwise indicated or required to comply with governing regulations.
 - 1. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 2. 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 specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
 - 1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
 - 2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- C. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

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.

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1. Spring Hinges: Adjust to achieve positive latching when door is allowed to close freely from an open position of 30 degrees.
 2. Door Closers: Unless otherwise required by authorities having jurisdiction, adjust sweep period so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.
- B. Occupancy Adjustment: Approximately six months after date of Substantial Completion, Installer's Architectural Hardware Consultant shall examine and readjust, including adjusting operating forces, each item of door hardware as necessary to ensure function of doors and door hardware.

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 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain door hardware and door hardware finishes. Refer to Division 1 Section "Demonstration and Training."

3.7 DOOR HARDWARE SETS

- A. Door Hardware Set No. 1

NOT USED.

- B. Door Hardware Set No. 2

Door No. 101, 107

1. 3 hinges.
2. 1 cylindrical lockset with lever handle: MARKS 195-RF/26D-F21.
3. 1 interchangeable core cylinder: Medeco UL 437 M-3.
4. 1 electric strike.
5. 1 door contact.
6. 1 closer: BHMA C02021
7. 1 lock guard.
8. 1 floor bumper.
9. 3 silencers.
10. 1 threshold.
11. 1 automatic door bottom.
12. Perimeter gasketing.
13. Kickplate, 8 inches high – push side of door leaf.

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C. Door Hardware Set No. 3

Door No. 102, 106, 104, 105, 108, 111, 113

1. 3 hinges.
2. 1 cylindrical lockset with lever handle: MARKS 195-RF/26D-F21.
3. 1 interchangeable core cylinder: Medeco UL 437 M-3.
4. 1 electric strike.
5. 1 door contact.
6. 1 closer: BHMA C02011
7. 1 floor bumper.
8. 3 silencers.
9. 1 threshold.
10. 1 automatic door bottom.
11. Perimeter gasketing.
12. Kickplate, 8 inches high – push side of door leaf.

D. Door Hardware Set No. 4

Door No. 110

1. 3 non-removable hinges.
2. 1 cylindrical lockset with lever handle: MARKS 5-CP-92-FS/32D-G3.
3. 1 interchangeable core cylinder: Medeco UL 437 M-3, #32-0200 housing
4. 1 electric strike.
5. 1 door contact.
6. 1 closer: BHMA C02011
7. 1 lock guard.
8. 1 floor bumper.
9. 3 silencers.
10. 1 threshold.
11. 1 automatic door bottom.
12. Perimeter gasketing.
13. Kickplate, 8 inches high – push side of door leaf.

E. Door Hardware Set No. 5

Door No. 109, 112

1. 3 non-removable hinges.
2. 1 cylindrical lockset with lever handle: MARKS 5-CP-92-FS/32D-G3.
3. 1 interchangeable core cylinder: Medeco UL 437 M-3, #32-0200 housing
4. 1 exit device.
5. 1 electric strike.
6. 1 door contact.
7. 1 closer: BHMA C02021
8. 1 lock guard.
9. 1 floor bumper.
10. 3 silencers.
11. 1 threshold.
12. 1 automatic door bottom.
13. Perimeter gasketing.

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14. Kickplate, 8 inches high – push side of door leaf.

F. Door Hardware Set No. 6

Door No. 114

1. 3 non-removable hinges.
2. 1 exit device (exit only).
3. 1 electric strike.
4. 1 door contact.
5. 1 closer: BHMA C02021
6. 1 lock guard.
7. 1 floor bumper.
8. 3 silencers.
9. 1 threshold.
10. 1 automatic door bottom.
11. Perimeter gasketing.
12. Kickplate, 8 inches high – push side of door leaf.

G. Door Hardware Set No. 7

Door No. 103

1. 3 non-removable hinges.
2. 1 door contact.

Balance of hardware existing.

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SECTION 088720 – ARCHITECTURAL WINDOW FILM

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 the following decorative glass for interior applications:
 - 1. Decorative film overlay for existing windows.

1.3 PERFORMANCE REQUIREMENTS

- A. Fire Performance: Surface burning characteristics when tested in accordance ASTM E 84:

1.4 SUBMITTALS

- A. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- B. Samples for Color Selection: Manufacturer's standard sample sets showing the full range of colors available for each type of product indicated.
- C. Samples for Verification: 12-inch square samples of each glazing film, of each product color specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by film manufacturer as having the necessary experience, staff, and training to install manufacturer's products according to specified requirements.
- B. Mockups: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Build mockups in the location and of the size indicated or, if not indicated, as directed by Architect.

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2. Do not proceed with remaining work until workmanship, color and sheen are approved by Architect.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing films according to manufacturer's written instructions and as needed to prevent damage condensation, temperature changes, direct exposure to sun, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Environmental Limitations: Do not proceed with film installation when ambient and substrate temperature conditions are outside limits permitted by manufacturer and when glass substrates are wet from frost, condensation, or other causes.

1.8 WARRANTY

- A. At project closeout, provide to Owner or Owners Representative an executed current copy of the manufacturer's standard limited warranty against manufacturing defect, outlining its terms, conditions, and exclusions from coverage.

PART 2 - PRODUCTS

- A. Architectural Window Film. Use single or multi-layered decorative film products applied to interior (project side) glass surfaces to achieve desired level of translucence.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Llumar Designer Window Film.
 - b. 3M Fasara.
 - c. 3M Crystal Window Finishes.

2.2 GLAZING FILM ACCESSORIES

- A. General: Provide products complying with requirements of glazing film manufacturer for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Adhesive: Pressure Sensitive acrylic adhesive system.
- C. Cleaners, Primers, and Sealers: Types recommended by glazing film manufacturer.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass and surrounding adjacent surfaces for conditions affecting installation.
 - 1. Report conditions that may adversely affect installation. In report, include description of any glass that is broken, chipped, cracked, abraded, or damaged in any way.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Beginning of installation means acceptance of conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Immediately before beginning installation of films, clean glass surfaces of substances that could impair glazing film's bond, including mold, mildew, oil, grease, dirt and other foreign materials.
- C. Protect window frames and surrounding conditions from damage during installation.

3.3 INSTALLATION

- A. General: Comply with glazing film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
 - 1. Install film continuously, but not necessarily in one continuous length. Install with no gaps or overlaps.
 - 2. If seamed, install with no gaps or overlaps. Install seams vertical and plumb. No horizontal seams allowed.
 - 3. Do not remove release liner from film until just before each piece of film is cut and ready for installation.
 - 4. Install film with mounting solution and custom cut to the glass with neat, square corners and edges to within 1/8 inch of the window frame.
 - 5. Remove air bubbles, wrinkles, blisters, and other defects.
- B. After installation, view film from a distance of 10 feet against a bright uniform sky or background. Film shall appear uniform in appearance with no visible streaks, banding, thin spots or pinholes.
 - 1. If installed film does not meet these criteria, remove and replace with new film.

3.4 CLEANING

- A. Remove excess mounting solution at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by glazing film manufacturer.

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SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes non-load-bearing steel framing members for the following applications:
 - 1. Interior framing systems (e.g., supports for partition walls, framed soffits, furring, etc.).
 - 2. Interior supplementary framing and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

PART 2 - PRODUCTS

2.1 NON-STRUCTURAL METAL FRAMING, GENERAL

- A. Recycled Content of Steel Products: Provide products with average recycled content of steel products such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized, unless otherwise indicated.

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2.2 STEEL FRAMING FOR FRAMED ASSEMBLIES

- A. Steel Studs and Runners: ASTM C 645.
 - 1. Minimum Base-Metal Thickness: 20 GA.
 - 2. Depth: As indicated on Drawings.
- B. Slip-Type Head Joints: Where indicated, provide one of the following:
 - 1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
 - a. Products: Subject to compliance with requirements, provide one of the following or equal:
 - 1) Steel Network Inc. (The); VertiTrack VTD Series.
 - 2) Superior Metal Trim; Superior Flex Track System (SFT).
 - 2. Products: Subject to compliance with requirements, provide one of the following or equal:
 - a. Fire Trak Corp.; Fire Track attached to studs with Fire Trak Slip Clip.
 - b. Metal-Lite, Inc.; The System.
- C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 - 1. Minimum Base-Metal Thickness: 0.027 inch.
- D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch- wide flanges.
 - 1. Depth: 1-1/2 inches.
 - 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide one of the following:
 - 1. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754, except comply with framing sizes and spacing indicated.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.
- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING FRAMED ASSEMBLIES

- A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- B. Install studs so flanges within framing system point in same direction.
 - 1. Space studs as follows:
 - a. Single-Layer Application: 24 inches o.c., unless otherwise indicated.
- C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
 - 1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb, unless otherwise indicated.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

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- c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.
 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
 4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- D. Direct Furring:
1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

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SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Interior gypsum board.
- B. Related Sections include the following:
 - 1. Division 9 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board.
 - 2. Division 9 Painting Section for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- A. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.

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- C. Do not install panels that are wet, those that are moisture damaged, and those that are 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.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

- A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.
- B. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. American Gypsum Co.
 - b. BPB America Inc.
 - c. G-P Gypsum.
 - d. Lafarge North America Inc.
 - e. National Gypsum Company.
 - f. PABCO Gypsum.
 - g. Temple.
 - h. USG Corporation.
- B. Regular Type:
 - 1. Thickness: 5/8 inch.
 - 2. Long Edges: Tapered.
- C. Type X (Special Fire-Resistant)
 - 1. Thickness: 5/8 inch
 - 2. Long Edges: tapered.

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2.3 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
 - 2. Shapes:
 - a. Cornerbead.
 - b. Bullnose bead.
 - c. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - d. L-Bead: L-shaped; exposed long flange receives joint compound.
 - e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
 - f. Expansion (control) joint.
 - g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.4 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Wallboard: Paper.
- C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. 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.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use setting-type, sandable topping compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. 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.

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- C. 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. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.
- D. Acoustical Sealant: As specified in Division 7 Section "Joint Sealants."
 - 1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- 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 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.

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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, except floors. 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. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- 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 recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 1. Regular Type: Vertical surfaces, unless otherwise indicated.
- B. Single-Layer Application:
 1. 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.
 2. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 FIRE-RESISTANT ASSEMBLIES

- A. Wherever fire-rated construction is indicated, provide materials and application methods, including types and spacing of fasteners, wall and ceiling framing in accordance with the specifications contained in UL Fire Resistance for the Design Number(s) indicated, or GA 600 for the File Number(s) indicated. Joints of fire-rated gypsum board enclosures shall be closed and sealed in accordance with UL test requirements or GA requirements. Seal penetrations through rated partitions and ceilings tight in accordance with tested systems.

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3.5 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 for visual effect.
- C. Interior Trim: Install in the following locations:
 - 1. Cornerbead: Use at outside corners.
 - 2. LC-Bead: Use at exposed panel edges.
 - 3. Curved-Edge Cornerbead: Use at curved openings.

3.6 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, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Division 9 Sections.

3.7 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. 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 092900

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SECTION 095113 - 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. This Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
 - 4. Minimum Drawing Scale: 1/4 inch = 1 foot.
- C. Samples for Initial Selection: For components with factory-applied color finishes.

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- D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of full-size Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch-long Samples of each type, finish, and color.
- E. Product Data:
 - 1. For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content.
 - a. Include statement indicating costs for each product having recycled content.
 - 2. For sealants, including printed statement of VOC content.
- F. Maintenance Data: For finishes to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical panel ceilings that comply with the following requirements:
 - 1. Fire-Resistance Characteristics: Where indicated, provide acoustical panel ceilings identical to those of assemblies tested for fire resistance per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - a. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency.
 - b. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 2. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
 - a. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Provide acoustical panel ceilings designed and installed to withstand the effects of earthquake motions according to the following:
 - 1. Standard for Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 - 2. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."
 - 3. CISCA's Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA's "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies--Seismic Zones 3 & 4."

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4. UBC Standard 25-2, "Metal Suspension Systems for Acoustical Tile and for Lay-in Panel Ceilings."
5. ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 9, "Earthquake Loads."

- D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages 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.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

1.8 COORDINATION

- A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Acoustical Ceiling Panels: Full-size panels equal to 2.0 percent of quantity installed.
 2. Suspension System Components: Quantity of each exposed component equal to 2.0 percent of quantity installed.
 3. Hold-Down Clips: Equal to 2.0 percent of quantity installed.

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PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 50 or less.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Recycled Content: Provide acoustical panels with recycled content.
- B. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface per ASTM E 795.
- C. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Contracting Officer from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- D. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.3 ACOUSTICAL PANELS FOR ACOUSTICAL PANEL CEILING

- A. Basis of Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.; Dune, Second Look, Anguled Tegular, Bright White.
 - 2. Certainteed.
 - 3. USG Corp.
- B. Classification: Provide panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: CE (perforated, small holes and lightly textured K (surface scored)).

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- C. Color: White.
- D. LR: Not less than 0.83.
- E. NRC: Not less than 0.50.
- F. CAC: Not less than 35.
- G. Thickness: 3/4 inch.
- H. Modular Size: Tegular 24" x 24".
- I. Antimicrobial Treatment: Fungicide based.
- J. Sag Resistance: Homiguard Plus.

2.4 METAL SUSPENSION SYSTEMS, GENERAL

- A. Recycled Content: Provide products made from steel sheet with average recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.
- B. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- C. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
 - 1. High-Humidity Finish: Comply with ASTM C 635 requirements for "Coating Classification for Severe Environment Performance" where high-humidity finishes are indicated.
- D. Attachment Devices: Size for five times the design load indicated in ASTM C 635, 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 per ASTM E 488 or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
 - a. Type: Postinstalled expansion anchors.
 - b. Corrosion Protection: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC 1 service condition.
 - c. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Group 1 Alloy 304 or 316 for bolts; Alloy 304 or 316 for anchor.
 - d. Corrosion Protection: Components fabricated from nickel-copper-alloy rods complying with ASTM B 164 for UNS No. N04400 alloy.
 - 2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching

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hangers of type indicated, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing and inspecting agency.

- E. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
 2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B 164, nickel-copper-alloy UNS No. N04400.
 4. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch - 0.135-inch diameter wire.
- F. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- G. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch-thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- H. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to accommodate seismic forces.
- I. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- J. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical panels in-place.

2.5 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc.; PreLude XL Ceiling Grid, Bright White.

2.6 METAL EDGE MOLDINGS AND TRIM

- A. Available Products: Subject to compliance with requirements, provide comparable product by one of the following:
1. Armstrong World Industries, Inc.
 2. Certainteed.
 3. USG Corp.
- B. 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.

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1. Provide manufacturer's standard edge moldings that fit acoustical panel edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
 2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.
 3. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- C. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements and the following:
1. Aluminum Alloy: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than the strength and durability properties of aluminum extrusions complying with ASTM B 221 for Alloy and Temper 6063-T5.
 2. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.
 3. Conversion-Coated Finish: AA-M12C42 (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating).
 4. Conversion-Coated and Factory-Primed Finish: AA-M12C42R1x (Chemical Finish: cleaned with inhibited chemicals; acid-chromate-fluoride-phosphate conversion coating; organic coating as follows):
 - a. Manufacturer's standard, factory-applied prime-coat finish ready for field painting.
 5. Class II, Clear Anodic Finish: AA-M12C22A31 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class II, clear coating 0.010 mm or thicker) complying with AAMA 611.
 6. Baked-Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; organic coating: as specified below). Apply baked enamel complying with paint manufacturer's written instructions for cleaning, conversion coating, and painting.
 - a. Organic Coating: Thermosetting, primer/topcoat system with a minimum dry film thickness of 0.8 to 1.2 mils.

2.7 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Acoustical Sealant for Exposed and Concealed Joints:
 - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.
 2. Acoustical Sealant for Concealed Joints:

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- a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
- b. Pecora Corporation; BA-98.
- c. Tremco, Inc.; Tremco Acoustical Sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings 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 acoustical panel ceilings.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Suspend ceiling hangers from building's structural members and as follows:
 1. Structural members have spray on fireproofing. Contractor shall take care during installation to minimize impact on existing fireproofing. Contractor is responsible for any damages they make to S.E.P.
 2. Install hangers plumb and free from contact with other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 4. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 5. 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.
 6. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures 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.
 7. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both

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- structure to which hangers are attached and type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
8. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 9. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 10. Do not attach hangers to steel deck tabs.
 11. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 12. 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.
 13. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- 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 permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
 3. 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.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans to conform to existing layout.
 2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension system runners and moldings.
 3. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
 4. For reveal-edged panels on suspension system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension system surfaces and panel faces flush with bottom face of runners.
 5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 6. Install hold-down clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions, unless otherwise indicated.

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7. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

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SECTION 096513 - 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 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.
- C. Product Schedule: For resilient products. Use same designations indicated on drawings.

1.4 QUALITY ASSURANCE

- A. Mockups: Provide resilient products with mockups specified in other sections.

1.5 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.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 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.

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- B. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- 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.

PART 2 - PRODUCTS

2.1 RESILIENT BASE B-1

- A. Resilient Base:
 - 1. Manufacturers: Subject to compliance with requirements, provide products as follows by one of the following:
 - a. Roppe Corporation, USA.
 - b. Johnsonite; Millwork Reveal.
- B. Resilient Base Standard: ASTM F 1861.
 - 1. Material Requirement: Type TP (rubber, thermoplastic).
 - 2. Manufacturing Method: Group I (solid, homogeneous).
 - 3. Style: Straight (flat or toeless).
- C. Minimum Thickness: 0.125 inch.
- D. Height: Per finish schedule.
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Preformed.
- G. Inside Corners: Preformed.
- H. Finish: As selected by Contracting Officer from manufacturer's full range.
- I. Colors: As selected by Contracting Officer from manufacturer's full range.

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 manufacturer for applications indicated.

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- B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. Cove Base Adhesives: Not more than 50 g/L.

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

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 and remove bumps and ridges to produce a uniform and smooth substrate.
- C. Do not install resilient products until they are same temperature as the space where they are to be installed.
 - 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

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 practicable without gaps at seams and with tops of adjacent pieces aligned.

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- 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. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of 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 surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Cover resilient products until Substantial Completion.

END OF SECTION 096513

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SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Resilient floor tile.

- B. Related Sections:

- 1. Division 9 Section "Resilient Wall Base and Accessories" for resilient base, reducer strips, and other accessories installed with resilient floor coverings.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units of each color and pattern of floor tile required.
- C. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation indicated.
 - 1. Engage an installer who employs workers for this Project who are trained or certified by manufacturer for installation techniques required.
- B. 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.

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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store floor tile 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 floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
1. 48 hours before installation.
 2. During installation.
 3. 48 hours after installation.
- B. Close spaces to traffic during floor tile installation.
- C. Close spaces to traffic for 48 hours after floor tile installation.
- D. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 RESILIENT FLOOR TILE

- A. Products – Basis of Design:
1. Subject to compliance with requirements, provide the following:
 - a. Mannington Commercial.
 2. Acceptable Manufactures include:
 - a. Armstrong
 - b. Congolium
 - c. Tarkett
- B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.
- C. Wearing Surface: Smooth.

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- D. Thickness: 0.125 inch.
- E. Size: 12 by 12 inches.
- F. Colors and Patterns: Selected from the manufacturer's full line by the Contracting Officer. Two colors of tile maybe selected in each space for a checkerboard pattern.

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 manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Asphalt Tile Adhesives: Not more than 50 g/L.
- C. Floor Polish: Provide protective liquid floor polish products as recommended by 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.
- B. 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 floor tile.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

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3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer[and as follows]. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement or less if required by the manufacturer.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install floor tiles until they are same temperature as space where they are to be installed.
 1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
- E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 1. Lay tiles square with room axis.
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
 1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern).
- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile

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installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

- H. Adhere floor tiles to flooring 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.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.
- B. Perform the following operations immediately after completing floor tile installation:
 - 1. Remove adhesive and other blemishes from exposed surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect floor tile products 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, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
 - 1. Apply two coat(s).
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Cover floor tile until Substantial Completion.

END OF SECTION 096519

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SECTION 096813 - CARPET TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes modular, tufted cut and loop carpet tile.
- B. Related Sections include the following:
 - 1. Division 9 Section "Resilient Wall Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation recommendations for each type of substrate.
- B. 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.
- C. 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.
- D. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.

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- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104, Section 5, "Storage and Handling."

1.6 PROJECT CONDITIONS

- A. Comply with CRI 104, Section 7.2, "Site Conditions; Temperature and Humidity" and Section 7.12, "Ventilation."
- B. Environmental Limitations: Do not install carpet tiles until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer's standard form in which 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, more than 10 percent loss of face fiber, edge raveling, snags, runs, loss of tuft bind strength, dimensional stability, excess static discharge, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, 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..

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PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Products: Subject to compliance with requirements, provide the following product or equal:
 - 1. Carpet tile as selected by Contracting Officer from manufacturer's full range.
- B. Pile Characteristic: Level loop.
- C. Surface Pile Weight: 26 oz./sq. yd.
- D. Size: 24 by 24 inches.

2.2 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 complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
 - 1. VOC Limits: Provide adhesives with VOC content not more than 50 g/L when calculated according to 40 CFR 59, Subpart D (EPA method 24).

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. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 - 2. Subfloor finishes comply with requirements specified by manufacturer for slabs receiving carpet tile.
 - 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- 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. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.
- E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. 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.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.
- H. Stagger joints of carpet tiles so carpet tile grid is offset from access flooring panel grid. Do not fill seams of access flooring panels with carpet adhesive; keep seams free of adhesive.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:

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1. Remove excess adhesive, seam sealer, 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 104, Section 16, "Protection of 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 096813

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SECTION 099123 - INTERIOR 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.
- B. Refer to specification section "Cutting and Patching" for patching requirements.

1.2 SUMMARY

- A. This Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Steel.
 - 2. Gypsum board.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Initial Selection: For each type of topcoat product indicated.
- C. 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.
- D. Product Data:
 - 1. For paints, including printed statement of VOC content and chemical components.

1.4 QUALITY ASSURANCE

- A. MPI Standards:
 - 1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
 - 2. Preparation and Workmanship: Comply with requirements in "MPI Architectural Painting Specification Manual" for products and paint systems indicated.

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1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
 - 1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. Duron, Inc.
 - 3. Valspar Corporation.

2.2 PAINT, 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.

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- B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
 2. Nonflat Topcoat Paints: VOC content of not more than 150 g/L.
 3. Primers, Sealers, and Undercoaters: VOC content of not more than 200 g/L.
- C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:
1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
 2. Restricted Components: Paints and coatings shall not contain any of the following:
 - a. Acrolein.
 - b. Acrylonitrile.
 - c. Antimony.
 - d. Benzene.
 - e. Butyl benzyl phthalate.
 - f. Cadmium.
 - g. Di (2-ethylhexyl) phthalate.
 - h. Di-n-butyl phthalate.
 - i. Di-n-octyl phthalate.
 - j. 1,2-dichlorobenzene.
 - k. Diethyl phthalate.
 - l. Dimethyl phthalate.
 - m. Ethylbenzene.
 - n. Formaldehyde.
 - o. Hexavalent chromium.
 - p. Isophorone.
 - q. Lead.
 - r. Mercury.
 - s. Methyl ethyl ketone.
 - t. Methyl isobutyl ketone.
 - u. Methylene chloride.
 - v. Naphthalene.
 - w. Toluene (methylbenzene).
 - x. 1,1,1-trichloroethane.
 - y. Vinyl chloride.
- D. Colors: As selected by Contracting Officer from manufacturer's full range, including custom colors.

2.3 PRIMERS/SEALERS

- A. Interior Latex Primer/Sealer:

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1. VOC Content: E Range of E2.
2. Environmental Performance Rating: EPR 2.

2.4 METAL PRIMERS

A. Quick-Drying Alkyd Metal Primer:

1. VOC Content: E Range of E2.

2.5 LATEX PAINTS

A. Interior Latex (Waterborne Eggshell Interior Paint): (Gloss as indicated in schedule).

1. VOC Content: E Range of E3.
2. Environmental Performance Rating: EPR 3.

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 work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 1. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Protect all adjacent interior surfaces and areas, rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.
- B. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- C. Remove plates, machined surfaces, and similar items already in place that 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.

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1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
 2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- D. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.
- E. Gypsum Board Substrates: Sand all gypsum board substrates to a level 4 finish. Patch and repair walls with drywall compound patch. Resand patched areas to assure seamless smooth finish. Do not begin paint application until substrate is dry and sanded smooth to a level 4 finish.

3.3 APPLICATION

- A. Apply primer and paints according to manufacturer's written instructions.
1. Prime all surfaces scheduled to receive paint per manufacturer's recommendations.
 2. Use applicators and techniques suited for primer, paint and substrate indicated.
 3. Prime and paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 4. Prime and paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
1. Owner will engage the services of a qualified testing agency to sample paint materials being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor

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will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 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.

3.6 INTERIOR PAINTING SCHEDULE

- A. Steel Substrates:
 - 1. Latex Over Alkyd Primer System:
 - a. Prime Coat: Alkyd anticorrosive metal primer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (semigloss).
- B. Gypsum Board Substrates:
 - 1. Latex System:
 - a. Prime Coat: Interior latex primer/sealer.
 - b. Intermediate Coat: Interior latex matching topcoat.
 - c. Topcoat: Interior latex (waterborne eggshell interior paint).

END OF SECTION 099123

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SECTION 101400 - SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Panel signs.

1.3 DEFINITIONS

- A. ADA-ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines."

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for signs.
 - 1. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
 - 2. Provide message list, typestyles, graphic elements, including tactile characters and Braille, and layout for each sign.
 - 3. Wiring Diagrams: Power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors available for the following:
 - 1. Plastic Laminate.
 - 2. All others requiring color selection.
- D. Samples for Verification: For each of the following products and for the full range of color, texture, and sign material indicated, of sizes indicated:
 - 1. Panel Signs: Full size samples of each type of sign required.

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1.5 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. Source Limitations for Signs: Obtain each sign type indicated from one source from a single manufacturer.
- C. Regulatory Requirements: Comply with applicable provisions in ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Verify recess openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1.7 COORDINATION

- A. Coordinate placement of anchorage devices with templates for installing signs.

PART 2 - PRODUCTS

2.1 PANEL SIGNS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide one of the following:
 - 1. ACE Sign Systems, Inc.
 - 2. Advance Corporation; Braille-Tac Division.
 - 3. Allen Industries Architectural Signage
 - 4. Allenite Signs; Allen Marking Products, Inc.
 - 5. APCO Graphics, Inc.
 - 6. ASI-Modulex, Inc.
 - 7. Best Sign Systems Inc.
 - 8. Bunting Graphics, Inc.
 - 9. Fossil Industries, Inc.
 - 10. Gemini Incorporated.
 - 11. Grimco, Inc.
 - 12. Innerface Sign Systems, Inc.
 - 13. InPro Corporation
 - 14. Matthews International Corporation; Bronze Division.
 - 15. Mills Manufacturing Company.
 - 16. Mohawk Sign Systems.

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17. Nelson-Harkins Industries.
18. Seton Identification Products.
19. Signature Signs, Incorporated.
20. Supersine Company (The)

2.2 PANEL SIGNS

- A. General: Provide panel signs that comply with requirements indicated for materials, thicknesses, finishes, colors, designs, shapes, sizes, and details of construction.
 1. Produce smooth panel sign surfaces constructed to remain flat under installed conditions within tolerance of plus or minus 1/16 inch measured diagonally.
- B. Plastic Laminate: Provide high-pressure laminate engraving stock with face and core plies in contrasting colors as selected by Architect from manufacturer's full range.
- C. Laminated Panels: Permanently laminate face panels to backing sheets of material; use manufacturer's standard process.
- D. Graphic Content and Style: Provide sign copy that complies with requirements indicated by UFAS for size, style, spacing, content, mounting height and location, material, finishes, and colors of signage.
- E. Tactile and Braille Copy: Manufacturer's standard process for producing copy complying with UFAS Guidelines and ICC/ANSI A117.1. Text shall be accompanied by Grade 2 Braille. Produce precisely formed characters with square cut edges free from burrs and cut marks.
 1. Raised-Copy Thickness: Not less than 1/32 inch.
- F. Engraved Copy: Machine engrave letters, numbers, symbols, and other graphic devices into panel sign on face indicated to produce precisely formed copy, incised to uniform depth.
- G. Engraved Plastic Laminate: Engrave through exposed face ply of plastic-laminate sheet to expose contrasting core ply.

2.3 PANEL SIGN TYPES

- A. Room Identification Signs:
 1. Material: Plastic laminate.
 2. Perimeter: Unframed.
 3. Copy: Raised.
 4. Size: As indicated on Drawings.
 5. Character style, message, and colors as selected by the Contracting Officer's from manufacturer's full range.

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2.4 ACCESSORIES

- A. Anchors and Inserts: Provide nonferrous-metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere as required for corrosion resistance. Use toothed steel or lead expansion-bolt devices for drilled-in-place anchors. Furnish inserts, as required, to be set into concrete or masonry work.

2.5 FABRICATION

- A. General: Provide manufacturer's standard signs of configurations indicated.
 - 1. Conceal fasteners if possible; otherwise, locate fasteners where they will be inconspicuous.

2.6 FINISHES, GENERAL

- A. Protect mechanical 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 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.

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 work.
- B. Verify that items are sized and located to accommodate signs.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Locate signs and accessories where indicated, using mounting methods of types described and complying with manufacturer's written instructions.
 - 1. Install signs level, plumb, and at heights indicated, with sign surfaces free of distortion and other defects in appearance.
 - 2. Interior Wall Signs: Install signs on walls adjacent to latch side of door where applicable. Where not indicated or possible, such as double doors, install signs on nearest adjacent walls. Locate to allow approach within 3 inches of sign without encountering protruding objects or standing within swing of door.

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- B. Wall-Mounted Signs: Comply with sign manufacturer's written instructions except where more stringent requirements apply.
 - 1. Silicone-Adhesive Mounting: Attach signs to irregular, porous, or vinyl-covered surfaces.
 - 2. Mechanical Fasteners: Use nonremovable mechanical fasteners placed through predrilled holes. Attach signs with fasteners and anchors suitable for secure attachment to substrate as recommended in writing by sign manufacturer.

3.3 CLEANING AND PROTECTION

- A. After installation, clean soiled sign surfaces according to manufacturer's written instructions. Protect signs from damage until acceptance by Owner.

END OF SECTION 101400

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SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following plumbing piping services:
 - 1. Domestic cold-water piping.
 - 2. Domestic hot-water piping.
 - 3. Sanitary waste piping exposed to ceiling plenums.
 - 4. Supplies and drains for handicap-accessible lavatories and sinks.
- B. Related Sections:
 - 1. Division 22 Section "Plumbing Equipment Insulation."

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.
- C. Comply with the following applicable standards and other requirements specified for miscellaneous components:

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1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," and "Indoor Piping Insulation Schedule," articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

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1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Pittsburgh Corning Corporation; Foamglas.
 - b. Approved equal.
2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied [ASJ] [ASJ-SSL]: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Fibrex Insulations Inc.; Coreplus 1200.
 - b. Johns Manville; Micro-Lok.
 - c. Knauf Insulation; 1000-Degree Pipe Insulation.
 - d. Manson Insulation Inc.; Alley-K.
 - e. Owens Corning; Fiberglas Pipe Insulation.
 - f. Approved equal.
2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Super-Stik.
 - b. Approved equal.

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.
 - b. Approved equal.

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2.3 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.
 - b. Approved equal.
 - 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
 - d. Mon-Eco Industries, Inc.; 22-25.
 - e. Approved equal.
 - 2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
 - b. Eagle Bridges - Marathon Industries; 225.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-20.

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- d. Mon-Eco Industries, Inc.; 22-25.
 - e. Approved equal.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- E. PVC Jacket Adhesive: Compatible with PVC jacket.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Dow Corning Corporation; 739, Dow Silicone.
 - b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
 - c. P.I.C. Plastics, Inc.; Welding Adhesive.
 - d. Speedline Corporation; Polyco VP Adhesive.
 - e. Approved equal.
 2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.4 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
 - c. Approved equal.
 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
 5. Color: White.

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- C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
 - b. Eagle Bridges - Marathon Industries; 550.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
 - d. Mon-Eco Industries, Inc.; 55-50.
 - e. Vimasco Corporation; WC-1/WC-5.
 - f. Approved equal.
 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
 3. Service Temperature Range: Minus 20 to plus 180 deg F.
 4. Solids Content: 60 percent by volume and 66 percent by weight.
 5. Color: White.

2.5 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
 - c. Vimasco Corporation; 713 and 714.
 - d. Approved equal.
 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
 4. Service Temperature Range: 0 to plus 180 deg F.
 5. Color: White.

2.6 SEALANTS

- A. Joint Sealants:
1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

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- a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Pittsburgh Corning Corporation; Pittseal 444.
 - f. Approved equal.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Permanently flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 100 to plus 300 deg F.
 5. Color: White or gray.
 6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- B. FSK and Metal Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Eagle Bridges - Marathon Industries; 405.
 - c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
 - d. Mon-Eco Industries, Inc.; 44-05.
 - e. Approved equal.
 2. Materials shall be compatible with insulation materials, jackets, and substrates.
 3. Fire- and water-resistant, flexible, elastomeric sealant.
 4. Service Temperature Range: Minus 40 to plus 250 deg F.
 5. Color: Aluminum.
 6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
- C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
 - b. Approved equal.

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2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.7 FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.
 - b. Approved equal.
- B. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
 - b. Vimasco Corporation; Elastafab 894.
 - c. b. Approved equal .

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2.9 FIELD-APPLIED CLOTHS

- A. Woven Glass-Fiber Fabric: Comply with MIL-C-20079H, Type I, plain weave, and presized a minimum of 8 oz./sq. yd..
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Alpha Associates, Inc.; Alpha-Maritex 84215 and 84217/9485RW, Luben 59.
 - b. Approved equal.

2.10 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 428 AWF ASJ.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
 - c. Compac Corporation; 104 and 105.
 - d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.
 - e. Approved equal.
 2. Width: 3 inches.
 3. Thickness: 11.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.
- B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Products: Subject to compliance with requirements available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 491 AWF FSK.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
 - c. Compac Corporation; 110 and 111.
 - d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
 - e. Approved equal.
 2. Width: 3 inches.
 3. Thickness: 6.5 mils.
 4. Adhesion: 90 ounces force/inch in width.
 5. Elongation: 2 percent.
 6. Tensile Strength: 40 lbf/inch in width.
 7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

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- C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ABI, Ideal Tape Division; 488 AWF.
 - b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
 - c. Compac Corporation; 120.
 - d. Venture Tape; 3520 CW.
 - e. Approved equal.
 2. Width: 2 inches.
 3. Thickness: 3.7 mils.
 4. Adhesion: 100 ounces force/inch in width.
 5. Elongation: 5 percent.
 6. Tensile Strength: 34 lbf/inch in width.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

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. Engineered Brass Company.
 - b. Insul-Tect Products Co.; a subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing.
 - d. Plumberex.
 - e. Truebro; a brand of IPS Corporation.
 - f. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 - g. Approved equal.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

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. Truebro; a brand of IPS Corporation.
 - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
 - c. Approved equal.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

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PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 - 1. Verify that systems to be insulated have been tested and are free of defects.
 - 2. Verify that surfaces to be insulated are clean and dry.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:
 - 1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
 - 2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.

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- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below-ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.

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2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.4 PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

3.5 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:
 1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient

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- services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

- A. Insulation Installation on Straight Pipes and Tubes:
1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
 2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
 3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
 4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.
- B. Insulation Installation on Pipe Flanges:
1. Install preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
 4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.
- C. Insulation Installation on Pipe Fittings and Elbows:

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1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

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4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.9 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

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3.10 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
 - 1. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.11 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Cold Water:
 - 1. NPS 1 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- B. Domestic Hot including Hot Water Dispenser Water:
 - 1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- C. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
- D. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inches thick.
 - b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.
- E. Hot Service Drains:
 - 1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1-1/2 inch thick.
 - b. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.
- F. Sink Pump Discharge Pipe:

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1. All Pipe Sizes: Insulation shall be one of the following:
 - a. Cellular Glass: 1" thick.
 - b. Mineral-Fiber, Preformed Pipe, Type I or II: 1/2" inch thick.

END OF SECTION 220719

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SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
 - 2. Encasement for piping.
 - 3. Specialty valves.
 - 4. Flexible connectors.

1.3 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Domestic water piping and support and installation shall withstand effects of earthquake motions determined according to ASCE/SEI 7.

1.4 SUBMITTALS

- A. Product Data: For the following products:
 - 1. Specialty valves.
 - 2. Transition fittings.
 - 3. Dielectric fittings.
 - 4. Flexible connectors.
- B. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF 14 for plastic, potable domestic water piping and components.
- C. Comply with NSF 61 for potable domestic water piping and components.

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1.6 PROJECT CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of water service.
 2. Do not proceed with interruption of water service without Owner's written permission.

1.7 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE AND FITTINGS

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
 2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
 3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
 4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.
 5. Copper Pressure-Seal-Joint Fittings:
 - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Elkhart Products Corporation; Industrial Division.
 - 2) NIBCO INC.
 - 3) Viega; Plumbing and Heating Systems.
 - 4) Approved equal.
 - b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
 6. Copper-Tube Extruded-Tee Connections:
 - 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:

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- 1) T-DRILL Industries Inc.
 - 2) Approved equal.
 - b. Description: Tee formed in copper tube according to ASTM F 2104.
7. Grooved-Joint Copper-Tube Appurtenances:
- 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) Anvil International.
 - 2) Shurjoint Piping Products.
 - 3) Victaulic Company.
 - 4) Approved equal.
 - b. Copper Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
 - c. Grooved-End-Tube Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

- A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.
- B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
- D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

- A. Full Port Ball Valves:
 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. Apollo 77-4100 (Basis of Design).
 - b. NIBCO INC.
 - c. Jamesbury.
 - d. Approved equal.
 2. Description:

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- a. Standard: MSS SP-110.
- b. Pressure Rating: 600 psi CWP.
- c. Body Material: Bronze.
- d. Body Design: Two Piece.
- e. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, threaded.
- f. Ball: Bronze chrome plated.
- g. Seals: RPTFE.
- h. Handle: Lever.

B. PVC Ball Check Valves:

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. American Valve, Inc.
- b. Asahi/America, Inc.
- c. Colonial Engineering, Inc.
- d. Fischer, George Inc.
- e. Hayward Flow Control Systems; Hayward Industrial Products, Inc.
- f. IPEX Inc.
- g. Legend Valve.
- h. NIBCO INC.
- i. Sloane, George Fischer, Inc.
- j. Spears Manufacturing Company.
- k. Thermoplastic Valves Inc.
- l. Approved equal.

2. Description:

- a. Pressure Rating: 125 psig at 73 deg F.
- b. Body Material: PVC.
- c. Body Design: Union-type ball check.
- d. End Connections for Valves NPS 2 (DN 50) and Smaller: Detachable, socket or threaded.

2.5 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Sleeve-Type Transition Coupling: AWWA C219.

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. Cascade Waterworks Manufacturing.

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- b. Dresser, Inc.; Dresser Piping Specialties.
- c. Ford Meter Box Company, Inc. (The).
- d. JCM Industries.
- e. Romac Industries, Inc.
- f. Smith-Blair, Inc; a Sensus company.
- g. Viking Johnson; c/o Mueller Co.
- h. Approved equal.

D. Plastic-to-Metal Transition Fittings:

- 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. Charlotte Pipe and Foundry Company.
 - b. Harvel Plastics, Inc.
 - c. Spears Manufacturing Company.
 - d. Approved equal.
- 2. Description PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert and one solvent-cement-socket or threaded end.

E. Plastic-to-Metal Transition Unions:

- 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. Colonial Engineering, Inc.
 - b. NIBCO INC.
 - c. Spears Manufacturing Company.
 - d. Approved equal.
- 2. Description: PVC four-part union. Include brass[or stainless-steel] threaded end, solvent-cement-joint or threaded plastic end, rubber O-ring, and union nut.

2.6 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

- 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. Capitol Manufacturing Company.
 - b. Central Plastics Company.
 - c. EPCO Sales, Inc.
 - d. Hart Industries International, Inc.
 - e. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - f. Zurn Plumbing Products Group; Wilkins Water Control Products.

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- g. Approved equal.
 - 2. Description:
 - a. Pressure Rating: 150 psig at 180 deg F (82 deg C).
 - b. End Connections: Solder-joint copper alloy and threaded ferrous.
- 2.7 FLEXIBLE CONNECTORS
- 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. Flex-Hose Co., Inc.
 - 2. Flexicraft Industries.
 - 3. Flex Pression, Ltd.
 - 4. Flex-Weld, Inc.
 - 5. Hyspan Precision Products, Inc.
 - 6. Mercer Rubber Co.
 - 7. Metraflex, Inc.
 - 8. Proco Products, Inc.
 - 9. Tozen Corporation.
 - 10. Unaflex, Inc.
 - 11. Universal Metal Hose; a Hyspan company
 - 12. Approved equal.
 - B. Bronze-Hose Flexible Connectors: Corrugated-bronze tubing with bronze wire-braid covering and ends brazed to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections NPS 2 (DN 50) and Smaller: Threaded copper pipe or plain-end copper tube.
 - 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged copper alloy.
 - C. Stainless-Steel-Hose Flexible Connectors: Corrugated-stainless-steel tubing with stainless-steel wire-braid covering and ends welded to inner tubing.
 - 1. Working-Pressure Rating: Minimum 200 psig.
 - 2. End Connections NPS 2 (DN 50) and Smaller: Threaded steel-pipe nipple.
 - 3. End Connections NPS 2-1/2 (DN 65) and Larger: Flanged steel nipple.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

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- B. Install shutoff valve immediately upstream of each dielectric fitting.
- C. Install domestic water piping level without pitch and plumb.
- D. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- F. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- G. Install piping adjacent to equipment and specialties to allow service and maintenance.
- H. Install piping to permit valve servicing.
- I. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.
- J. Install piping free of sags and bends.
- K. Install fittings for changes in direction and branch connections.
- L. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- M. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- N. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."
- O. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.2 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - 1. Apply appropriate tape or thread compound to external pipe threads.
 - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Braze Joints" Chapter.

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- E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Pressure-Sealed Joints: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.
- G. Copper-Tubing, Push-on Joints: Clean end of tube. Measure insertion depth with manufacturer's depth gage. Join copper tube and push-on-joint fittings by inserting tube to measured depth.
- H. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- I. Copper-Tubing Grooved Joints: Roll groove end of tube. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for roll-grooved joints.
- J. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - 1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
 - 2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
 - 3. PVC Piping: Join according to ASTM D 2855.
- K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.3 VALVE INSTALLATION

- A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.
- B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use full port ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.
- C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves shall be full port ball valves.
 - 1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
 - 2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

3.4 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:

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1. NPS 1-1/2 (DN 40) and Smaller: Fitting-type coupling.
2. NPS 2 (DN 50) and Larger: Sleeve-type coupling.

- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 (DN 50) and Smaller: Plastic-to-metal transition fittings or unions.

3.5 DIELECTRIC FITTING INSTALLATION

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements in this Section for pipe hanger and support products and installation.
1. Vertical Piping: MSS Type 8 or 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs:
 - a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
 - c. Longer than 100 Feet (30 m) If Indicated: MSS Type 49, spring cushion rolls.
 3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and at each floor.
- C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).
- D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
 2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
- E. Install supports for vertical copper tubing every 10 feet.
- F. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
 1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
- G. Install supports for vertical PVC piping every 48 inches (1200 mm).
- H. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

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3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
 - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 - 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
 - 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection.

3.8 IDENTIFICATION

- A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.
- B. Label pressure piping with system operating pressure.

3.9 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Piping Inspections:
 - 1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
 - 2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 - 3. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
 - 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- C. Piping Tests:

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1. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
 2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
 3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
 6. Prepare reports for tests and for corrective action required.
- D. Domestic water piping will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Perform the following adjustments before operation:
1. Close drain valves, hydrants, and hose bibbs.
 2. Open shutoff valves to fully open position.
 3. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
 4. Remove and clean strainer screens. Close drain valves and replace drain plugs.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

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- c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Clean non-potable domestic water piping as follows:
1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.
- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
 1. Hard copper tube, ASTM B 88, Type L; cast- or wrought- copper solder-joint fittings; and soldered joints.

3.13 VALVE SCHEDULE

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use full port ball or gate valves for piping NPS 2 and smaller.
 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.
- C. PVC valves matching piping materials may be used.

END OF SECTION 221116

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SECTION 221316 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe, tube, and fittings.
 - 2. Specialty pipe fittings.
- B. Related Sections:
 - 1. Division 22 Section "Sanitary Sewerage Pumps" for effluent and sewage pumps.

1.3 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
 - 2. Waste, Force-Main Piping: 50 psig.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

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1.6 PROJECT CONDITIONS

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
1. Notify Owner no fewer than two days in advance of proposed interruption of sanitary waste service.
 2. Do not proceed with interruption of sanitary waste service without Owner's written permission.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 PVC PIPE AND FITTINGS

- A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
- B. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
- C. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
- D. Adhesive Primer: ASTM F 656.
1. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Solvent Cement: ASTM D 2564.
1. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.3 SPECIALTY PIPE FITTINGS

- A. Transition Couplings:
1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
 2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
 3. Unshielded, Nonpressure Transition Couplings:

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- 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) Dallas Specialty & Mfg. Co.
 - 2) Fernco Inc.
 - 3) Mission Rubber Company; a division of MCP Industries, Inc.
 - 4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
 - 5) Approved equal.
 - b. Standard: ASTM C 1173.
 - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
 - d. Sleeve Materials:
 - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
 - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
 - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
4. Pressure Transition Couplings:
- 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) Cascade Waterworks Mfg. Co.
 - 2) Dresser, Inc.
 - 3) EBAA Iron, Inc.
 - 4) JCM Industries, Inc.
 - 5) Romac Industries, Inc.
 - 6) Smith-Blair, Inc.; a Sensus company.
 - 7) The Ford Meter Box Company, Inc.
 - 8) Viking Johnson.
 - 9) Approved equal.
 - b. Standard: AWWA C219.
 - c. Description: Metal, sleeve-type same size as, with pressure rating at least equal to, and ends compatible with, pipes to be joined.
 - d. Center-Sleeve Material: Manufacturer's standard.
 - e. Gasket Material: Natural or synthetic rubber.
 - f. Metal Component Finish: Corrosion-resistant coating or material.
- B. Dielectric Fittings:
1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
 2. Dielectric Unions:
 - 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:

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- 1) Capitol Manufacturing Company.
 - 2) Central Plastics Company.
 - 3) Hart Industries International, Inc.
 - 4) Jomar International Ltd.
 - 5) Matco-Norca, Inc.
 - 6) McDonald, A. Y. Mfg. Co.
 - 7) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - 8) Wilkins; a Zurn company.
 - 9) Approved equal.
- b. Description:
- 1) Standard: ASSE 1079.
 - 2) Pressure Rating: 125 psig minimum at 180 deg F.
 - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Nipples:
- 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) Elster Perfection.
 - 2) Grinnell Mechanical Products.
 - 3) Matco-Norca, Inc.
 - 4) Precision Plumbing Products, Inc.
 - 5) Victaulic Company.
 - 6) Approved equal.
- b. Description:
- 1) Electroplated steel nipple complying with ASTM F 1545.
 - 2) Pressure Rating: 300 psig at 225 deg F.
 - 3) End Connections: Male threaded or grooved.
 - 4) Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

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- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- K. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:
 - 1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
 - 3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.
- L. Install aboveground PVC piping according to ASTM D 2665.
- M. Install force mains at elevations indicated.
- N. Plumbing Specialties:
 - 1. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
 - 2. Install drains in sanitary drainage gravity-flow piping.
- O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors.
- Q. Install sleeve seals for piping penetrations of concrete walls and slabs.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.2 JOINT CONSTRUCTION

- A. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

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1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

B. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 Appendixes.

3.3 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in OD's.
2. In Drainage Piping: Unshielded, nonpressure transition couplings.
3. In Aboveground Force Main Piping: Fitting-type transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric nipples or unions.

3.4 VALVE INSTALLATION

A. General valve installation requirements are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install ball check valve, between pump and shutoff valve, on sewage pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Install backwater valves in accessible locations.
3. Comply with requirements for backwater valve specified in Division 22 Section "Sanitary Waste Piping Specialties."

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in this Section.

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1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
 2. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
 3. Vertical Piping: MSS Type 8 or Type 42, clamps.
 4. Install individual, straight, horizontal piping runs:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
 5. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 6. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- E. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:
1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
- F. Install supports for vertical PVC piping every 48 inches.
- G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
 5. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection.
- D. Connect force-main piping to the following:

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1. Sanitary Sewer: To existing force main as indicated.
 2. Sewage Pump: To sewage pump discharge.
- E. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- F. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.7 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.

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6. Prepare reports for tests and required corrective action.
- E. Test force-main piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Leave uncovered and unconcealed new, altered, extended, or replaced force-main piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 2. Cap and subject piping to static-water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
 3. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 4. Prepare reports for tests and required corrective action.

3.9 CLEANING AND PROTECTION

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.
- D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

3.10 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:
 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
 1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
 2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.
- D. Aboveground sanitary-sewage force mains NPS 1-1/2 and NPS 2 shall be the following:
 1. Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. PVC schedule 80 with socket fittings.

END OF SECTION 221316

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SECTION 221329 - SANITARY SEWERAGE PUMPS

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. Packaged, submersible sewage-pump units.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Wiring Diagrams: For power, signal, and control wiring.
- C. Operation and Maintenance Data: For pumps and controls, to include in operation and maintenance manuals.

1.4 QUALITY ASSURANCE

- A. 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.
- B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Retain shipping flange protective covers and protective coatings during storage.
- B. Protect bearings and couplings against damage.
- C. Comply with pump manufacturer's written rigging instructions for handling.

1.6 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided.

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PART 2 - PRODUCTS

2.1 PACKAGED, SUBMERSIBLE SEWAGE-PUMP UNITS

A. Packaged, Submersible, Nonclog, Sewage-Pump Units:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Goulds Pumps; ITT Corporation.
 - b. Grundfos Pumps Corp.
 - c. Liberty Pumps.
 - d. Little Giant Pump Co.
 - e. McDonald, A. Y. Mfg. Co.
 - f. PACO Pumps; Grundfos Pumps Corporation, U.S.A.
 - g. Pentair Pump Group; Hydromatic Pumps.
 - h. Pentair Pump Group; Myers.
 - i. Sta-Rite Industries, Inc.
 - j. Zoeller Company.
2. Description: Factory-assembled and -tested, automatic-operation, basin-mounted, sewage-pump unit.
3. Pump Type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller centrifugal pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron.
5. Impeller: Brass or cast iron; statically and dynamically balanced, non-clog design, and capable of handling 2-inch diameter solids.
6. Motor: Hermetically sealed, capacitor-start type; with built-in overload protection; lifting eye or lug; and three-conductor, waterproof power cable of length required and with grounding plug and cable-sealing assembly for connection at pump.
7. Control: Manufacturer's standard panel for one pump.
8. Controls: Automatic, with mechanical- or mercury-float switches and alternator.
9. Pump Discharge Piping: Factory or field fabricated, PVC.
10. Basin: Watertight plastic and of size required for pumps, with inlet pipe connection and gastight cover with pump discharge and vent connections.

B. Capacities and Characteristics:

1. System Capacity: 21.
2. Number of Pumps: One.
3. Each Pump:
 - a. Capacity: 21.
 - b. Total Dynamic Head: 20.
 - c. Speed: 1550.
 - d. Discharge Pipe Size: 1-1/2 inch.
 - e. Motor Horsepower: 1/2 inch.
 - f. Electrical Characteristics:
 - 1) Volts: 120.
 - 2) Phases: Single.
 - 3) Hertz: 60.

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4. Alternator Control Required: No.
5. Basin:
 - a. Dimensions: 14 inches.
 - b. Inlet Size: 1-1/2 inches.
 - c. Bottom to Inlet Centerline: As furnished.
 - d. Vent Size: 1-1/2 inches.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 22 Section "Common Motor Requirements for Plumbing Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
- B. Motors for submersible pumps shall be hermetically sealed.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation and filling are specified in Division 31 Section "Earth Moving."

3.2 EXAMINATION

- A. Examine roughing-in for plumbing piping to verify actual locations of sanitary drainage and vent piping connections before sewage pump installation.

3.3 INSTALLATION

- A. Pump Installation Standards:
 1. Comply with HI 1.4 for installation of centrifugal pumps.
- B. Equipment Mounting: Install sewage pumps using elastomeric pads.
- C. Wiring Method: Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

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3.4 CONNECTIONS

- A. Comply with requirements for piping specified in Division 22 Section "Sanitary Waste and Vent Piping." Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection.
 - 2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Pumps and controls will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.7 ADJUSTING

- A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.
- B. Adjust control set points.

3.8 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

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END OF SECTION 221329

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SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following conventional plumbing fixtures and related components:
 - 1. Faucets for sinks.
 - 2. Protective shielding guards.
 - 3. Hot-water dispensers.
 - 4. Kitchen sinks.

1.3 DEFINITIONS

- A. ABS: Acrylonitrile-butadiene-styrene plastic.
- B. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- C. Cast Polymer: Cast-filled-polymer-plastic material. This material includes cultured-marble and solid-surface materials.
- D. Cultured Marble: Cast-filled-polymer-plastic material with surface coating.
- E. Fitting: Device that controls the flow of water into or out of the plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, shower heads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.
- F. FRP: Fiberglass-reinforced plastic.
- G. PMMA: Polymethyl methacrylate (acrylic) plastic.
- H. PVC: Polyvinyl chloride plastic.
- I. Solid Surface: Nonporous, homogeneous, cast-polymer-plastic material with heat-, impact-, scratch-, and stain-resistance qualities.

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1.4 SUBMITTALS

- A. Product Data: For each type of plumbing fixture indicated. Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports. Indicate materials and finishes, dimensions, construction details, and flow-control rates.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.
- D. Warranty: Special warranty specified in this Section.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 - 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act" for plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- E. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- F. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- G. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Stainless-Steel Residential Sinks: ASME A112.19.3.
- H. Comply with the following applicable standards and other requirements specified for sink faucets:
 - 1. Faucets: ASME A112.18.1.
 - 2. NSF Potable-Water Materials: NSF 61.
 - 3. Pipe Threads: ASME B1.20.1.
 - 4. Supply Fittings: ASME A112.18.1.
 - 5. Brass Waste Fittings: ASME A112.18.2.
- I. Comply with the following applicable standards:

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1. Hot-Water Dispensers: ASSE 1023 and UL 499.
2. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.6 WARRANTY

- A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace components of whirlpools that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
 - a. Structural failures of unit shell.
 - b. Faulty operation of controls, blowers, pumps, heaters, and timers.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal use.
 2. Warranty Period for Commercial Applications: One year from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Faucet Washers and O-Rings: Equal to 1 percent of amount of each type and size installed.
 2. Faucet Cartridges and O-Rings: Equal to 1 percent of amount of each type and size installed.

PART 2 - PRODUCTS

2.1 SINK FAUCETS

- A. Sink Faucets:
1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. American Standard Companies, Inc.
 - b. Bradley Corporation.
 - c. Broadway Collection.
 - d. Chicago Faucets.
 - e. Delta Faucet Company.
 - f. Dormont Manufacturing Company.
 - g. Eljer.
 - h. Elkay Manufacturing Co.
 - i. Fisher Manufacturing Co.
 - j. Grohe America, Inc.
 - k. Just Manufacturing Company.
 - l. Kohler Co.
 - m. Moen, Inc.
 - n. Royal Brass Mfg. Co.
 - o. Sayco; a Briggs Plumbing Products, Inc. Company.

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- p. Speakman Company.
 - q. T & S Brass and Bronze Works, Inc.
 - r. Zurn Plumbing Products Group; Commercial Brass Operation.
2. Description: Kitchen faucet without spray. Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture holes; coordinate outlet with spout and fixture receptor.
- a. Body Material: Commercial, solid brass.
 - b. Finish: Polished chrome plate.
 - c. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
 - d. Mixing Valve: As per model number.
 - e. Backflow Protection Device for Hose Outlet: Not required.
 - f. Backflow Protection Device for Side Spray: Not required.
 - g. Centers: 4 inches.
 - h. Mounting: Deck.
 - i. Handle(s): Wrist blade, 4 inches.
 - j. Inlet(s): NPS 3/8 tubing with NPS 1/2 male adapter.
 - k. Spout Type: Swing, round tubular.
 - l. Spout Outlet: Aerator.
 - m. Vacuum Breaker: Not required.
 - n. Operation: Compression, manual.
 - o. Drain: Basket.

2.2 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Engineered Brass Co.
 - b. Insul-Tect Products Co.; a Subsidiary of MVG Molded Products.
 - c. McGuire Manufacturing Co., Inc.
 - d. Plumberex Specialty Products Inc.
 - e. TCI Products.
 - f. TRUEBRO, Inc.
 - g. Zurn Plumbing Products Group; Tubular Brass Plumbing Products Operation.
 - h. Approved equal.
- 2. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. TRUEBRO, Inc.
 - b. Approved equal.

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2. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

2.3 HOT-WATER DISPENSERS

A. Hot-Water Dispensers:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Anaheim Manufacturing, Inc.; a Subsidiary of Western Industries, Inc.
 - b. Franke Consumer Products, Inc.; Kitchen Systems Div.
 - c. In-Sink-Erator; a div. of Emerson Electric Co.
 - d. Just Manufacturing Company.
 - e. Elkay Manufacturing Co.
 - f. KitchenAid.
 - g. Approved equal.
2. Description: Spout with twist-knob or push-button, flow control, household-type dispenser with instant on-off control; insulated, corrosion-resistant-metal storage tank that is open to atmosphere; electric heating element; chrome-plated faucet or spout; removable strainer; thermostat control for water temperature up to 190 deg F; and thermal-overload protection.
 - a. Storage Tank Capacity: 0.5 gal..
 - b. Heating Element: 750 W minimum, 115-V ac.

2.4 KITCHEN SINKS

A. Kitchen Sinks:

1. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
 - a. Elkay Manufacturing Co.
 - b. Eljer.
 - c. Jacuzzi, Inc.
 - d. Kohler Co.
 - e. Gerber Plumbing Fixtures LLC.
 - f. American Standard Companies, Inc.
2. Description: Two-bowl, residential, counter-mounting, stainless-steel kitchen sink.
 - a. Overall Dimensions: As scheduled.
 - b. Metal Thickness: 0.050 inch.
 - c. Left Bowl:
 - 1) Dimensions: As scheduled.
 - 2) Drain: 3-1/2-inch crumb cup.

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- a) Location: Near back of bowl.
- d. Right Bowl:
 - 1) Dimensions: As scheduled.
 - 2) Drain: 3-1/2-inch crumb cup.
 - a) Location: Near back of bowl.
- e. Sink Faucet: As scheduled.
- f. Supplies: NPS 1/2 chrome-plated copper with stops.
- g. Drain Piping: NPS 1-1/2 chrome-plated, cast-brass P-trap; 0.045-inch- thick tubular brass waste to wall; continuous waste; and wall escutcheon(s).
- h. Drain Piping: Schedule 40 PVC, NPS 1-1/2 P-trap; tubular waste to wall; continuous waste; and wall escutcheon(s).
- i. Disposer: Not required.
- j. Dishwasher Air-Gap Fitting: Not required.
- k. Hot-Water Dispenser: See other paragraphs of this section.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before plumbing fixture installation.
- B. Examine cabinets, counters, floors, and walls for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.
- B. Install counter-mounting fixtures in and attached to casework.
- C. Install fixtures level and plumb according to roughing-in drawings.
- D. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
 - 1. Exception: Use full port ball, gate, or globe valves if supply stops are not specified with fixture.
- E. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- F. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

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- G. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- H. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.
- I. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- J. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- K. Install hot-water dispensers in back top surface of sink or in countertop with spout over sink.
- L. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."
- M. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

- A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.
- B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

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3.5 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust hot-water dispensers. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at faucets to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.

3.6 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.
- B. After completing installation of exposed, factory-finished fixtures, faucets, and fittings, inspect exposed finishes and repair damaged finishes.

3.7 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224000

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SECTION 233113 - METAL DUCTS

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. Single-wall rectangular ducts and fittings.
 - 2. Sheet metal materials.
 - 3. Duct liner.
 - 4. Sealants and gaskets.
 - 5. Hangers and supports.
 - 6. Seismic-restraint devices.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports and seismic restraints shall withstand the effects of gravity and seismic loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 - 1. Seismic Hazard Level C: Seismic force to weight ratio, 0.15.
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

- A. Product Data: For each type of the following products:
 - 1. Liners and adhesives.
 - 2. Sealants and gaskets.
 - 3. Seismic-restraint devices.
- B. Shop Drawings:

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1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Fittings.
4. Reinforcement and spacing.
5. Seam and joint construction.
6. Penetrations through fire-rated and other partitions.
7. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
8. Hangers and supports, including methods for duct and building attachment, seismic restraints, and vibration isolation.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports; AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements,

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materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
 - 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 DUCT LINER

- A. Fibrous-Glass Duct Liner: Comply with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. CertainTeed Corporation; Insulation Group.
 - b. Johns Manville.
 - c. Knauf Insulation.
 - d. Owens Corning.
 - 2. Maximum Thermal Conductivity:
 - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
 - 3. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
 - 4. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.
 - a. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.
5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.
7. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall. Fabricate edge facings at the following locations:
 - a. Fan discharges.
 - b. Intervals of lined duct preceding unlined duct.
 - c. Upstream edges of transverse joints in ducts where air velocities are higher than 2500 fpm or where indicated.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
 - a. Sheet Metal Inner Duct Perforations: 3/32-inch diameter, with an overall open area of 23 percent.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:

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1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Solvent-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Base: Synthetic rubber resin.
3. Solvent: Toluene and heptane.
4. Solids Content: Minimum 60 percent.
5. Shore A Hardness: Minimum 60.
6. Water resistant.
7. Mold and mildew resistant.
8. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. VOC: Maximum 395 g/L.
10. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
11. Service: Indoor or outdoor.
12. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

E. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:
 - 1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 - 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 - 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."
- C. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- D. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- G. Trapeze and Riser Supports:
 - 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

2.6 SEISMIC-RESTRAINT DEVICES

- A. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2. Ductmate Industries, Inc.
 - 3. Hilti Corp.
 - 4. Kinetics Noise Control.
 - 5. Loos & Co.; Cableware Division.
 - 6. Mason Industries.
 - 7. TOLCO; a brand of NIBCO INC.
 - 8. Unistrut Corporation; Tyco International, Ltd.
- B. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

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1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.
- C. Channel Support System: Shop- or field-fabricated support assembly made of slotted steel channels rated in tension, compression, and torsion forces and with accessories for attachment to braced component at one end and to building structure at the other end. Include matching components and corrosion-resistant coating.
- D. Restraint Cables: ASTM A 603, galvanized-steel cables with end connections made of cadmium-plated steel assemblies with brackets, swivel, and bolts designed for restraining cable service; and with an automatic-locking and clamping device or double-cable clips.
- E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.
- F. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

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- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

- A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.
- B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.
- C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.
- D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.
- E. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
 - 2. Unconditioned Space, Exhaust Ducts: Seal Class C.
 - 3. Unconditioned Space, Return-Air Ducts: Seal Class B.
 - 4. Conditioned Space, Exhaust Ducts: Seal Class B.
 - 5. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 - 1. Where practical, install concrete inserts before placing concrete.
 - 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 - 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 - 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

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5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1, "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 SEISMIC-RESTRAINT-DEVICE INSTALLATION

- A. Install ducts with hangers and braces designed to support the duct and to restrain against seismic forces required by applicable building codes. Comply with SMACNA's "Seismic Restraint Manual: Guidelines for Mechanical Systems."
 1. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
 2. Brace a change of direction longer than 12 feet.
- B. Select seismic-restraint devices with capacities adequate to carry present and future static and seismic loads.
- C. Install cables so they do not bend across edges of adjacent equipment or building structure.
- D. Install cable restraints on ducts that are suspended with vibration isolators.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction.
- F. Attachment to Structure: If specific attachment is not indicated, anchor bracing and restraints to structure, to flanges of beams, to upper truss chords of bar joists, or to concrete members.
- G. Drilling for and Setting Anchors:
 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcement or embedded items during drilling. Notify the Architect if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed 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. Wedge 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. Set anchors to manufacturer's recommended torque, using a torque wrench.

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5. Install zinc-coated steel anchors for interior applications and stainless-steel anchors for applications exposed to weather.

3.6 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.8 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Duct System Cleanliness Tests:
 1. Visually inspect duct system to ensure that no visible contaminants are present.
 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- C. Duct system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

3.9 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:

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1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Return and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

- A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Ducts Connected to Equipment Not Listed Above:
 - a. Pressure Class: Positive or negative 1-inch wg.

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- b. Minimum SMACNA Seal Class: B.
 - c. SMACNA Leakage Class for Rectangular: 3.
- B. Intermediate Reinforcement:
- 1. Galvanized-Steel Ducts: Galvanized steel.
- C. Liner:
- 1. Return Air Ducts: Fibrous glass, Type I, 1 inch thick.
 - 2. Exhaust Air Ducts: Fibrous glass, Type I, 1 inch thick.
 - 3. Transfer Ducts: Fibrous glass, Type I, 1 inch thick
- D. Branch Configuration:
- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
 - 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.

END OF SECTION 233113

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SECTION 233423 - HVAC POWER VENTILATORS

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. In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

- A. Project Altitude: Base fan-performance ratings on sea level.
- B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:
 - 1. Certified fan performance curves with system operating conditions indicated.
 - 2. Certified fan sound-power ratings.
 - 3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
 - 4. Dampers, including housings, linkages, and operators.
 - 5. Fan speed controllers.
- B. Operation and Maintenance Data: For power ventilators to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. 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.
- B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.
- C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

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1.6 COORDINATION

- A. Coordinate size and location of structural-steel support members.
- B. Coordinate sizes and locations of equipment supports with actual equipment provided.

PART 2 - PRODUCTS

2.1 IN-LINE CENTRIFUGAL FANS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - 1. Acme Engineering & Manufacturing Corporation.
 - 2. American Coolair Corporation.
 - 3. Ammerman; Millennium Equipment.
 - 4. Breidert Air Products.
 - 5. Carnes Company.
 - 6. FloAire.
 - 7. Greenheck Fan Corporation.
 - 8. Hartzell Fan Incorporated.
 - 9. JencoFan.
 - 10. Loren Cook Company.
 - 11. Madison Manufacturing.
 - 12. PennBarry.
 - 13. Quietaire Inc.
 - 14. Approved equal.
- B. Housing: Split, spun aluminum with aluminum straightening vanes, inlet and outlet flanges, and support bracket adaptable to floor, side wall, or ceiling mounting.
- C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing.
- D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.
- E. Accessories:
 - 1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
 - 2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
 - 3. Companion Flanges: For inlet and outlet duct connections.
 - 4. Fan Guards: 1/2- by 1-inch mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
- F. Capacities and Characteristics:
 - 1. Airflow: As scheduled.
 - 2. External Static Pressure: As scheduled.
 - 3. Fan Diameter: As scheduled.
 - 4. Wheel Type: Forward curved.

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5. Class: I.
6. Fan rpm: 1550.
7. Electrical Characteristics:
 - a. Volts: 115.
 - b. Phase: 1.
 - c. Hertz: 60.
8. Vibration Isolators:
 - a. Type: Elastomeric hangers.
 - b. Static Deflection: 1/4 inch.

2.2 MOTORS

- A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
- B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

- A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.
- B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install power ventilators level and plumb.
- B. Support units using elastomeric mounts having a static deflection of 1/4 inch. Vibration- and seismic-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."
 1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

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- C. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1/4 inch.
- D. Install units with clearances for service and maintenance.
- E. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

- A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."
- B. Install ducts adjacent to power ventilators to allow service and maintenance.
- C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. Verify that shipping, blocking, and bracing are removed.
 - 2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
 - 3. Verify that cleaning and adjusting are complete.
 - 4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
 - 5. Adjust damper linkages for proper damper operation.
 - 6. Verify lubrication for bearings and other moving parts.
 - 7. Verify that manual and automatic volume control dampers in connected ductwork systems are in fully open position.
 - 8. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
 - 9. Shut unit down and reconnect automatic temperature-control operators.
 - 10. Remove and replace malfunctioning units and retest as specified above.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

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- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust damper linkages for proper damper operation.
- B. Adjust belt tension.
- C. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.
- D. Lubricate bearings.

END OF SECTION 233423

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SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

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. Fixed face registers and grilles.
 - 2. Linear bar grilles.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 REGISTERS AND GRILLES

- A. Fixed Face Register:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes.
 - d. Dayus Register & Grille Inc.
 - e. Hart & Cooley Inc.
 - f. Krueger.
 - g. Nailor Industries Inc.
 - h. Price Industries.
 - i. Titus.
 - j. Tuttle & Bailey.

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2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: ¾" spaced blades.
5. Core Construction: Integral.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw.
8. Damper Type: Adjustable opposed blade.

B. Fixed Face Grille:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. A-J Manufacturing Co., Inc.
 - b. Anemostat Products; a Mestek company.
 - c. Carnes.
 - d. Dayus Register & Grille Inc.
 - e. Hart & Cooley Inc.
 - f. Krueger.
 - g. Nailor Industries Inc.
 - h. Price Industries.
 - i. Titus.
 - j. Tuttle & Bailey.
2. Material: Aluminum.
3. Finish: Baked enamel, color selected by Architect.
4. Face Arrangement: blades on ¾" centers.
5. Core Construction: Integral.
6. Frame: 1-1/4 inches wide.
7. Mounting: Countersunk screw.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. Install registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.
- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

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SECTION 238126 - SPLIT-SYSTEM AIR-CONDITIONERS

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 split-system air-conditioning units consisting of separate evaporator-fan and compressor-condenser components.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Include performance data in terms of capacities, outlet velocities, static pressures, sound power characteristics, motor requirements, and electrical characteristics.

1.4 QUALITY ASSURANCE

- A. 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.
- B. ASHRAE Compliance:
 - 1. Fabricate and label refrigeration system to comply with ASHRAE 15, "Safety Standard for Refrigeration Systems."
 - 2. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 4 - "Outdoor Air Quality," Section 5 - "Systems and Equipment," Section 6 - "Procedures," and Section 7 - "Construction and System Start-Up."
- C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004.

1.5 COORDINATION

- A. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork are specified in Division 03 Section "Cast-in-Place Concrete."
- B. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

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1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of split-system air-conditioning units that fail in materials or workmanship within specified warranty period.
1. Warranty Period:
 - a. For Compressor: Five year(s) from date of Substantial Completion.
 - b. For Parts: One year(s) from date of Substantial Completion.
 - c. For Labor: One year(s) from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Filters: One set(s) for each air-handling unit.
 2. Gaskets: One set(s) for each access door.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
1. Carrier Corporation; Home Comfort and HVAC Building & Industrial Systems.
 2. Coleman Company Inc. (The).
 3. First Operations LP.
 4. Friedrich Air Conditioning Company.
 5. Koldwave, Inc.; a Mestek company.
 6. Lennox International Inc.
 7. Mitsubishi Electric & Electronics USA, Inc.; HVAC Advanced Products Division.
 8. Mitsubishi Electric Sales Canada Inc.
 9. Mitsubishi Heavy Industries America, Inc.
 10. SANYO North America Corporation; SANYO Fisher Company.
 11. Trane; a business of American Standard companies.
 12. YORK; a Johnson Controls company.

2.2 INDOOR UNITS 5 TONS OR LESS

- A. Wall-Mounted, Evaporator-Fan Components:
1. Cabinet: Enameled steel with removable panels on front and ends in color selected by Architect, and discharge drain pans with drain connection.

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2. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and thermal-expansion valve. Comply with ARI 210/240.
3. Electric Coil: Helical, nickel-chrome, resistance-wire heating elements; with refractory ceramic support bushings, automatic-reset thermal cutout, built-in magnetic contactors, manual-reset thermal cutout, airflow proving device, and one-time fuses in terminal box for overcurrent protection.
4. Fan: Direct drive, centrifugal.
5. Fan Motors:
 - a. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."
 - b. Multitapped, multispeed with internal thermal protection and permanent lubrication.
 - c. Enclosure Type: Totally enclosed, fan cooled.
 - d. NEMA Premium (TM) efficient motors as defined in NEMA MG 1.
 - e. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
 - f. Mount unit-mounted disconnect switches on interior of unit.
6. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
7. Condensate Drain Pans:
 - a. Fabricated with two percent slope in at least two planes to collect condensate from cooling coils (including coil piping connections, coil headers, and return bends) and humidifiers, and to direct water toward drain connection.
 - 1) Length: Extend drain pan downstream from leaving face to comply with ASHRAE 62.1-2004.
 - 2) Depth: A minimum of 1 inch deep.
 - b. Single-wall, stainless-steel sheet.
 - c. Drain Connection: Located at lowest point of pan and sized to prevent overflow. Terminate with threaded nipple on both ends of pan.
 - 1) Minimum Connection Size: NPS 1.
 - d. Pan-Top Surface Coating: Asphaltic waterproofing compound.
8. Air Filtration Section:
 - a. General Requirements for Air Filtration Section:
 - 1) Comply with NFPA 90A.
 - 2) Minimum Arrestance: According to ASHRAE 52.1 and MERV according to ASHRAE 52.2.
 - 3) Filter-Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lifted out from access plenum.
 - b. Disposable Panel Filters:

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- 1) Factory-fabricated, viscous-coated, flat-panel type.
- 2) Thickness: 1 inch.
- 3) Arrestance according to ASHRAE 52.1: 80.
- 4) Merv according to ASHRAE 52.2: 5.
- 5) Media: Interlaced glass fibers sprayed with nonflammable adhesive and antimicrobial agent.
- 6) Frame: Galvanized steel, with metal grid on outlet side, steel rod grid on inlet side, and hinged; with pull and retaining handles.

2.3 OUTDOOR UNITS (5 TONS OR LESS)

A. Air-Cooled, Compressor-Condenser Components:

1. Casing: Steel, finished with baked enamel in color selected by Architect, with removable panels for access to controls, weep holes for water drainage, and mounting holes in base. Provide brass service valves, fittings, and gage ports on exterior of casing.
2. Compressor: Hermetically sealed with crankcase heater and mounted on vibration isolation device. Compressor motor shall have thermal- and current-sensitive overload devices, start capacitor, relay, and contactor.
 - a. Compressor Type: Scroll.
 - b. Two-speed compressor motor with manual-reset high-pressure switch and automatic-reset low-pressure switch.
 - c. Refrigerant Charge: R-407C or R-410A.
 - d. Refrigerant Coil: Copper tube, with mechanically bonded aluminum fins and liquid subcooler. Comply with ARI 210/240.
3. Fan: Aluminum-propeller type, directly connected to motor.
4. Motor: Permanently lubricated, with integral thermal-overload protection.
5. Low Ambient Kit: Permits operation down to 45 deg F.
6. Mounting Base: Polyethylene.

2.4 ACCESSORIES

- A. Control equipment and sequence of operation are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."
- B. Thermostat: Wireless infrared functioning to remotely control compressor and evaporator fan, with the following features:
 1. Compressor time delay.
 2. 24-hour time control of system stop and start.
 3. Liquid-crystal display indicating temperature, set-point temperature, time setting, operating mode, and fan speed.
 4. Fan-speed selection including auto setting.
- C. Automatic-reset timer to prevent rapid cycling of compressor.

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- D. Refrigerant Line Kits: Soft-annealed copper suction and liquid lines factory cleaned, dried, pressurized, and sealed; factory-insulated suction line with flared fittings at both ends.
- E. Drain Hose: For condensate.
- F. Additional Monitoring:
 - 1. Monitor constant and variable motor loads.
 - 2. Monitor variable-frequency-drive operation.
 - 3. Monitor economizer cycle.
 - 4. Monitor cooling load.
 - 5. Monitor air distribution static pressure and ventilation air volumes.

2.5 CAPACITIES AND CHARACTERISTICS

- A. Cooling Capacity: As Scheduled.
- B. Indoor Unit: As Scheduled.
- C. Outdoor Unit: As Scheduled.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install units level and plumb.
- B. Install evaporator-fan components using manufacturer's standard mounting devices securely fastened to building structure.
- C. Install compressor-condenser components on inside plenum as noted.
- D. Support ground-mounted, compressor-condenser components as noted.
- E. Install seismic restraints.
- F. Install compressor-condenser components on mounting pads as noted.
- G. Install and connect precharged refrigerant tubing to component's quick-connect fittings. Install tubing to allow access to unit.

3.2 CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

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3.3 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- B. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. Tests and Inspections:
 - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.4 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
 - 1. Complete installation and startup checks according to manufacturer's written instructions.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain units.

END OF SECTION 238126

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.
 - 3. Sleeves and sleeve seals for cables.
- B. Related Sections include the following:
 - 1. Division 26 Section "Medium-Voltage Cables" for single-conductor and multiconductor cables, cable splices, and terminations for electrical distribution systems with 2001 to 35,000 V.
 - 2. Division 26 Section "Undercarpet Electrical Power Cables" for flat cables for undercarpet installations.
 - 3. Division 27 Section "Communications Horizontal Cabling" for cabling used for voice and data circuits.

1.3 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a

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nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Alcan Products Corporation; Alcan Cable Division.
 2. American Insulated Wire Corp.; a Leviton Company.
 3. General Cable Corporation.
 4. Senator Wire & Cable Company.
 5. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AFC Cable Systems, Inc.
 2. Hubbell Power Systems, Inc.
 3. O-Z/Gedney; EGS Electrical Group LLC.
 4. 3M; Electrical Products Division.
 5. Tyco Electronics Corp.

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- B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

- A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.
- B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
- C. Sleeves for Rectangular Openings: Galvanized sheet steel with minimum 0.052- or 0.138-inch thickness as indicated and of length to suit application.

2.4 SLEEVE SEALS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Advance Products & Systems, Inc.
 - 2. Calpico, Inc.
 - 3. Metraflex Co.
 - 4. Pipeline Seal and Insulator, Inc.
- B. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.
 - 1. Sealing Elements: EPDM interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
 - 2. Pressure Plates: Carbon steel. Include two for each sealing element.
 - 3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- B. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.

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- C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- D. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- F. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- G. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- H. Class 2 Control Circuits: Type THHN-THWN, in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

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3.5 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.
- B. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.
- C. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."
- D. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Penetration Firestopping."

3.6 SLEEVE-SEAL INSTALLATION

- A. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.7 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.8 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform tests and inspections and prepare test reports.
- C. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test feeder conductors, for compliance with requirements.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
- D. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

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- E. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

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LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

260519 - 6

AMEC Environment & Infrastructure, Inc.

SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. ENT: Electrical nonmetallic tubing.
- C. EPDM: Ethylene-propylene-diene terpolymer rubber.
- D. FMC: Flexible metal conduit.
- E. IMC: Intermediate metal conduit.
- F. LFMC: Liquidtight flexible metal conduit.
- G. LFNC: Liquidtight flexible nonmetallic conduit.
- H. NBR: Acrylonitrile-butadiene rubber.
- I. RNC: Rigid nonmetallic conduit.

1.4 SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Custom enclosures and cabinets.
- C. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

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1. Structural members in the paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in the paths of conduit groups with common supports.

D. Qualification Data: For professional engineer and testing agency.

E. Source quality-control test reports.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 METAL CONDUIT AND TUBING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Alfex Inc.
3. Allied Tube & Conduit; a Tyco International Ltd. Co.
4. Anamet Electrical, Inc.; Anaconda Metal Hose.
5. Electri-Flex Co.
6. Manhattan/CDT/Cole-Flex.
7. Maverick Tube Corporation.
8. O-Z Gedney; a unit of General Signal.
9. Wheatland Tube Company.

B. Rigid Steel Conduit: ANSI C80.1.

C. EMT: ANSI C80.3.

D. FMC: Zinc-coated steel.

E. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

1. Fittings for EMT: Steel, set-screw type.

F. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

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2.2 NONMETALLIC CONDUIT AND TUBING

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AFC Cable Systems, Inc.
 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
 3. Arco Corporation.
 4. CANTEX Inc.
 5. CertainTeed Corp.; Pipe & Plastics Group.
 6. Condux International, Inc.
 7. ElecSYS, Inc.
 8. Electri-Flex Co.
 9. Lamson & Sessions; Carlon Electrical Products.
 10. Manhattan/CDT/Cole-Flex.
 11. RACO; a Hubbell Company.
 12. Thomas & Betts Corporation.
- B. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- C. LFNC: UL 1660.
- D. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- E. Fittings for LFNC: UL 514B.

2.3 METAL WIREWAYS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Cooper B-Line, Inc.
 2. Hoffman.
 3. Square D; Schneider Electric.
- B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
- C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type.
- E. Finish: Manufacturer's standard enamel finish.

2.4 SURFACE RACEWAYS

- A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

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- a. Thomas & Betts Corporation.
- b. Walker Systems, Inc.; Wiremold Company (The).
- c. Wiremold Company (The); Electrical Sales Division.

2.5 BOXES, ENCLOSURES, AND CABINETS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
2. EGS/Appleton Electric.
3. Erickson Electrical Equipment Company.
4. Hoffman.
5. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
6. O-Z/Gedney; a unit of General Signal.
7. RACO; a Hubbell Company.
8. Robroy Industries, Inc.; Enclosure Division.
9. Scott Fetzer Co.; Adalet Division.
10. Spring City Electrical Manufacturing Company.
11. Thomas & Betts Corporation.
12. Walker Systems, Inc.; Wiremold Company (The).
13. Woodhead, Daniel Company; Woodhead Industries, Inc. Subsidiary.

B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, ferrous alloy, Type FD, with gasketed cover.

D. Metal Floor Boxes: Cast metal, fully adjustable, rectangular.

E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

F. Cabinets:

1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
2. Hinged door in front cover with flush latch and concealed hinge.
3. Key latch to match panelboards.
4. Metal barriers to separate wiring of different systems and voltage.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

A. Comply with the following indoor applications, unless otherwise indicated:

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed, Not Subject to Severe Physical Damage: EMT.
3. Concealed in Ceilings and Interior Walls and Partitions: EMT.

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4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
 5. Raceways for Optical Fiber or Communications Cable: EMT from jacks to above accessible ceilings. Above accessible ceilings J-hooks are acceptable.
 6. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.
 7. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
 8. Boxes and Enclosures: NEMA 250, Type 1.
 9. Raceway Fittings for Security Wiring: EMT, all locations.
- B. Minimum Raceway Size 3/4-inch trade size for power. Minimum size for communications shall be 1 inch.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
- D. Do not install aluminum conduits in contact with concrete.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- H. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lbtensile strength. Leave at least 12 inches of slack at each end of pull wire.
- I. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:
 1. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
 2. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.

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- J. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where otherwise required by NFPA 70.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change.
 - 4. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at the time of installation.
- K. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC in damp or wet locations not subject to severe physical damage.
- L. Set metal floor boxes level and flush with finished floor surface.
- M. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly.

3.4 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533

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SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Distribution panelboards.
 - 2. Lighting and appliance branch-circuit panelboards.

1.3 DEFINITIONS

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field Quality-Control Reports:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

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1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Keys: Two spares for each type of panelboard cabinet lock.
 2. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.

1.8 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- B. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- C. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- D. 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.
- E. Comply with NEMA PB 1.
- F. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Handle and prepare panelboards for installation according to NEMA PB 1.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations:
 1. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
 - a. Ambient Temperature: Not exceeding minus 22 deg F to plus 104 deg F.
 - b. Altitude: Not exceeding 6600 feet.

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- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
 - 1. Ambient temperatures within limits specified.
 - 2. Altitude not exceeding 6600 feet.

- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
 - 1. Notify Owner no fewer than two days in advance of proposed interruption of electric service.
 - 2. Do not proceed with interruption of electric service without Owner's written permission.
 - 3. Comply with NFPA 70E.

1.11 COORDINATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

- B. Coordinate sizes and locations of concrete bases with actual equipment provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

1.12 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Fabricate and test panelboards according to IEEE 344 to withstand seismic forces defined in Section 260548.16 "Seismic Controls for Electrical Systems."

- B. Enclosures: Surface-mounted cabinets.
 - 1. Rated for environmental conditions at installed location.
 - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.

 - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.

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3. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
 4. Gutter Extension and Barrier: Same gage and finish as panelboard enclosure; integral with enclosure body. Arrange to isolate individual panel sections.
 5. Finishes:
 - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
 - b. Back Boxes: Galvanized steel.
 6. Directory Card: Inside panelboard door, mounted in transparent card holder.
- C. Incoming Mains Location: Top or bottom.
- D. Phase, Neutral, and Ground Buses:
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
 3. Extra-Capacity Neutral Bus: Neutral bus rated 200 percent of phase bus and UL listed as suitable for nonlinear loads.
- E. Conductor Connectors: Suitable for use with conductor material and sizes.
1. Material: Hard-drawn copper, 98 percent conductivity.
 2. Main and Neutral Lugs: Mechanical type.
 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
 4. Gutter-Tap Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
 5. Extra-Capacity Neutral Lugs: Rated 200 percent of phase lugs mounted on extra-capacity neutral bus.
- F. Service Equipment Label: NRTL labeled for use as service equipment for panelboards or load centers with one or more main service disconnecting and overcurrent protective devices.
- G. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. No series ratings allowed.

2.2 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Siemens Energy & Automation, Inc.
 4. Square D; a brand of Schneider Electric.

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- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Lugs only.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Concealed hinges; secured with flush latch with tumbler lock; keyed alike.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 - 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 - 3. Siemens Energy & Automation, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.
 - 1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."
 - 2. Fused Switch Features and Accessories: Standard ampere ratings and number of poles.
 - 3. Auxiliary Contacts: One normally open and normally closed contact(s) that operate with switch handle operation.
- C. Non-Fused Switch: Type HD; amperage as indicated on drawings.

2.4 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Receive, inspect, handle, and store panelboards according to NEMA PB 1.1.
- B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
- C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

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3.2 INSTALLATION

- A. Install panelboards and accessories according to NEMA PB 1.1.
- B. Mount top of trim 72 inches above finished floor unless otherwise indicated.
- C. Mount panelboard cabinet plumb and rigid without distortion of box.
- D. Install overcurrent protective devices and controllers not already factory installed.
- E. Install filler plates in unused spaces.
- F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.
- G. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- H. Comply with NECA 1.

3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components.
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate and where it is fed from.
- D. Label all receptacle faceplates with panelboard and circuit number.

3.4 FIELD QUALITY CONTROL

- A. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- B. Tests and Inspections:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- C. Panelboards will be considered defective if they do not pass tests and inspections.

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- D. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly, and lubricate as recommended by manufacturer.
- B. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
 - 1. Measure as directed during period of normal system loading.
 - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
 - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
 - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 262416

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Receptacles with integral surge suppression units.
 - 3. Wall-box motion sensors.
 - 4. Isolated-ground receptacles.
 - 5. Hospital-grade receptacles.
 - 6. Snap switches and wall-box dimmers.
 - 7. Solid-state fan speed controls.
 - 8. Wall-switch and exterior occupancy sensors.
 - 9. Communications outlets.
 - 10. Pendant cord-connector devices.
 - 11. Cord and plug sets.
 - 12. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.

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- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 1. Cord and Plug Sets: Match equipment requirements.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Service/Power Poles: One for every 10, but no fewer than one.
 - 2. Floor Service Outlet Assemblies: One for every 10, but no fewer than one.
 - 3. Poke-Through, Fire-Rated Closure Plugs: One for every five floor service outlets installed, but no fewer than two.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

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2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 5351 (single), 5352 (duplex).
 - b. Hubbell; HBL5351 (single), CR5352 (duplex).
 - c. Leviton; 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5381 (single), 5352 (duplex).

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; GF20.
 - b. Pass & Seymour; 2084.

2.4 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade.
 - 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip.
 - 2. External Cable Grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.5 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected.
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent.
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.6 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.

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B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

2.7 COMMUNICATIONS OUTLETS

A. Voice and Data Outlets:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper; 3560-6.
 - b. Leviton; 40649.
2. Description: Double RJ-45, unless noted otherwise, jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

2.8 WALL PLATES

A. Single and combination types to match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
3. Material for Unfinished Spaces: Galvanized steel.

2.9 FLOOR SERVICE FITTINGS

- A. Type: Modular, pedestal, dual-service units suitable for wiring method used.
- B. Compartments: Barrier separates power from voice and data communication cabling.
- C. Power Receptacle: NEMA WD 6 configuration 5-20R, unless otherwise indicated.
- D. Voice and Data Communication Outlets: Two modular, keyed, color-coded, RJ-45 Category 5e jacks for UTP cable, unless noted otherwise.

2.10 POKE-THROUGH ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Hubbell Incorporated; Wiring Device-Kellems.

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2. Pass & Seymour/Legrand; Wiring Devices & Accessories.
3. Square D/ Schneider Electric.
4. Thomas & Betts Corporation.
5. Wiremold Company (The).

B. Description: Factory-fabricated and -wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.

1. Service Outlet Assembly: Flush type with two simplex receptacles and space for two RJ-45 jacks.
2. Size: Selected to fit nominal 4-inch-cored holes in floor and matched to floor thickness.
3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablish fire rating of floor.
5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors and a minimum of four, 4-pair, Category 5e voice and data communication cables.

2.11 SERVICE POLES

A. Description: Factory-assembled and -wired units to extend power and voice and data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.

1. Poles: Nominal 2.5-inch-square cross section, with height adequate to extend from floor to at least 6 inches above ceiling, and with separate channels for power wiring and voice and data communication cabling.
2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
3. Finishes: Manufacturer's standard painted finish and trim combination.
4. Wiring: Sized for minimum of five No. 12 AWG power and ground conductors and a minimum of four, 4-pair, Category 3 or 5 voice and data communication cables.
5. Power Receptacles: Two duplex, 20-A, heavy-duty, NEMA WD 6 configuration 5-20R units.
6. Voice and Data Communication Outlets: Two RJ-45 Category 5e jacks.

2.12 FINISHES

A. Color: Wiring device catalog numbers in Section Text do not designate device color.

1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.
2. Wiring Devices Connected to Emergency Power System: Red.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:

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1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

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- H. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

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SECTION 271500 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

1. UTP cabling.
2. 62.5/125-micrometer, optical fiber cabling.
3. Coaxial cable.
4. Multiuser telecommunications outlet assemblies.
5. Cable connecting hardware, patch panels, and cross-connects.
6. Telecommunications outlet/connectors.
7. Cabling system identification products.
8. Cable management system.

- B. Related Requirements:

1. Section 280513 "Conductors and Cables for Electronic Safety and Security" for voice and data cabling associated with system panels and devices.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. Consolidation Point: A location for interconnection between horizontal cables extending from building pathways and horizontal cables extending into furniture pathways.
- C. Cross-Connect: A facility enabling the termination of cable elements and their interconnection or cross-connection.
- D. EMI: Electromagnetic interference.
- E. IDC: Insulation displacement connector.
- F. LAN: Local area network.
- G. Outlet/Connectors: A connecting device in the work area on which horizontal cable or outlet cable terminates.

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- H. RCDD: Registered Communications Distribution Designer.
- I. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate layout and installation of telecommunications cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For coaxial cable, include the following installation data for each type used:
 - a. Nominal OD.
 - b. Minimum bending radius.
 - c. Maximum pulling tension.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer, qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For splices and connectors to include in maintenance manuals.

1.8 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. Device Plates: One of each type.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff.

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1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
2. Installation Supervision: Installation shall be under the direct supervision of Level 2 Installer, who shall be present at all times when Work of this Section is performed at Project site.
3. Testing Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cables to determine the continuity of the strand end to end. Use optical fiber flashlight or optical loss test set.
2. Test optical fiber cables while on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; including the loss value of each. Retain test data and include the record in maintenance data.
3. Test each pair of UTP cable for open and short circuits.

PART 2 - PRODUCTS

2.1 HORIZONTAL CABLING DESCRIPTION

A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called a "permanent link," a term that is used in the testing protocols.

1. TIA/EIA-568-B.1 requires that a minimum of two telecommunications outlet/connectors be installed for each work area.
2. Horizontal cabling shall contain no more than one transition point or consolidation point between the horizontal cross-connect and the telecommunications outlet/connector.
3. Bridged taps and splices shall not be installed in the horizontal cabling.
4. Splitters shall not be installed as part of the optical fiber cabling.

B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Horizontal cabling system shall comply with transmission standards in TIA/EIA-568-B.1 when tested according to test procedures of this standard.

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- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Grounding: Comply with J-STD-607-A.

2.3 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. ADC.
 - 2. Belden Inc.
 - 3. Berk-Tek; a Nexans company.
 - 4. CommScope, Inc.
 - 5. Draka Cableteq USA.
 - 6. Genesis Cable Products; Honeywell International, Inc.
 - 7. Mohawk; a division of Belden Networking, Inc.
 - 8. Superior Essex Inc.
 - 9. SYSTIMAX Solutions; a CommScope, Inc. brand.
 - 10. 3M Communication Markets Division.
 - 11. Tyco Electronics Corporation; AMP Products.
- B. Description: 100-ohm, four-pair UTP, formed into 25-pair, binder groups covered with a blue thermoplastic jacket.
 - 1. Comply with ICEA S-90-661 for mechanical properties.
 - 2. Comply with TIA/EIA-568-B.1 for performance specifications.
 - 3. Comply with TIA/EIA-568-B.2, Category 5e.
 - 4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
 - a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.
 - b. Communications, Riser Rated: Type CMR, complying with UL 1666.

2.4 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. American Technology Systems Industries, Inc.
 - 2. Belden Inc.
 - 3. Dynacom Inc.
 - 4. Hubbell Premise Wiring.
 - 5. Leviton Commercial Networks Division.
 - 6. Molex Premise Networks; a division of Molex, Inc.
 - 7. Panduit Corp.
 - 8. Siemon Co. (The).
 - 9. Tyco Electronics Corporation; AMP Products.

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- B. General Requirements for Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, four-pair cables in 36-inch lengths; terminated with eight-position modular plug at each end.
 - 1. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
 - 2. Patch cords shall have color-coded boots for circuit identification.

2.5 COAXIAL CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. Belden Inc.
 - 3. Coleman Cable, Inc.
 - 4. CommScope, Inc.
 - 5. Draka Cableteq USA.
- B. Cable Characteristics: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
 - 1. No. 14 AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
 - 4. Jacketed with sunlight-resistant, black PVC or PE.
 - 5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

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- D. NFPA and UL compliance, listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655 and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
1. CATV Cable: Type CATV.
 2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.
 3. CATV Riser Rated: Type CATVR, complying with UL 1666.
 4. CATV Limited Rating: Type CATVX.

2.6 COAXIAL CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Emerson Network Power Connectivity Solutions.
 2. Leviton Commercial Networks Division.
 3. Siemon Co. (The).
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.7 CONSOLIDATION POINTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Technology Systems Industries, Inc.
 2. Belden Inc.
 3. Chatsworth Products, Inc.
 4. Dynacom Inc.
 5. Hubbell Premise Wiring.
 6. Molex Premise Networks; a division of Molex, Inc.
 7. Ortronics, Inc.; a subsidiary of Legrand Group.
 8. Panduit Corp.
 9. Siemon Co. (The).
- B. Description: Consolidation points shall comply with requirements for cable connecting hardware.
1. Number of Terminals per Field: One for each conductor in assigned cables.
 2. Number of Connectors per Field:
 - a. One for each four-pair conductor group of indicated cables, plus 25 percent spare positions.
 3. Mounting: Recessed in ceiling.
 4. NRTL listed as complying with UL 50 and UL 1863.
 5. When installed in plenums used for environmental air, NRTL listed as complying with UL 2043.

2.8 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-B.1.

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- B. Workstation Outlets: Two-port-connector assemblies mounted in single faceplate.
 - 1. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
 - 2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
 - a. Flush mounting jacks, positioning the cord at a 45-degree angle.
 - 3. Legend: Snap-in, clear-label covers and machine-printed paper inserts.

2.9 GROUNDING

- A. Comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems" for grounding conductors and connectors.
- B. Comply with J-STD-607-A.

2.10 IDENTIFICATION PRODUCTS

- A. Comply with TIA/EIA-606-A and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory-sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHODS

- A. Install cables in pathways and cable trays except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces where unenclosed wiring method may be used. Conceal pathways and cables except in unfinished spaces.

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1. Install plenum cable in all locations.
 2. Comply with raceway requirements in Section 260533.
- B. Conceal conductors and cables in accessible ceilings, walls, and floors where possible.
- C. Wiring within Enclosures:
1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 2. Install lacing bars and distribution spools.
 3. Install conductors parallel with or at right angles to sides and back of enclosure.
- 3.2 INSTALLATION OF CABLES
- A. Comply with NECA 1.
- B. General Requirements for Cabling:
1. Comply with TIA/EIA-568-B.1.
 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 3. Install 110-style IDC termination hardware unless otherwise indicated.
 4. MUTOA shall not be used as a cross-connect point.
 5. Consolidation points may be used only for making a direct connection to telecommunications outlet/connectors:
 - a. Do not use consolidation point as a cross-connect point, as a patch connection, or for direct connection to workstation equipment.
 - b. Locate consolidation points for UTP at least 49 feet from communications equipment room.
 6. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
 7. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 8. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 9. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 10. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 11. In the communications equipment room, install a 10-foot- long service loop on each end of cable.
 12. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
1. Comply with TIA/EIA-568-B.2.
 2. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

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D. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

E. Group connecting hardware for cables into separate logical fields.

F. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 FIRESTOPPING

- A. Comply with TIA-569-B, Annex A, "Firestopping."
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.4 GROUNDING

- A. Install grounding according to BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

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- B. Comply with J-STD-607-A.
- C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A.
- B. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- C. Cable and Wire Identification:
 - 1. Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 - 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 - 3. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
 - 4. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 - 5. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- D. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in TIA/EIA-606-A.
 - 1. Cables use flexible vinyl or polyester that flex as cables are bent.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform the following tests and inspections:
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.

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2. Visually confirm Category 5e, marking of outlets, cover plates, outlet/connectors, and patch panels.
 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 5. UTP Performance Tests:
 - a. Test for each outlet. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Wire map.
 - 2) Length (physical vs. electrical, and length requirements).
 - 3) Insertion loss.
 - 4) Near-end crosstalk (NEXT) loss.
 - 5) Power sum near-end crosstalk (PSNEXT) loss.
 - 6) Equal-level far-end crosstalk (ELFEXT).
 - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 8) Return loss.
 - 9) Propagation delay.
 - 10) Delay skew.
 6. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

END OF SECTION 271500

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SECTION 280513 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

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. UTP cabling.
 - 2. Coaxial cabling.
 - 3. RS-232 cabling.
 - 4. RS-485 cabling.
 - 5. Low-voltage control cabling.
 - 6. Control-circuit conductors.
 - 7. Fire alarm wire and cable.
 - 8. Identification products.

1.3 DEFINITIONS

- A. BICSI: Building Industry Consulting Service International.
- B. EMI: Electromagnetic interference.
- C. IDC: Insulation displacement connector.
- D. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control and signaling power-limited circuits.
- E. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).
- F. RCDD: Registered Communications Distribution Designer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For coaxial cable, include the following installation data for each type used:
 - a. Nominal OD.

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- b. Minimum bending radius.
- c. Maximum pulling tension.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.
- B. Source quality-control reports.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An NRTL.
 - 1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
 - 1. Test each pair of UTP cable for open and short circuits.

1.8 FIELD CONDITIONS

- A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.
 - 1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.
- B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. 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.

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2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Belden Inc.
- B. Description: Belden cable 8444, 2 pair, twisted cable, 22 gauge.

2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Belden Inc.
- B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.
- C. Connecting Blocks: 110-style for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.4 COAXIAL CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. Belden Inc.
 - 3. Coleman Cable, Inc.
 - 4. CommScope, Inc.
 - 5. Draka Cableteq USA.
- B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.
- C. RG-11/U: NFPA 70, Type CATV.
 - 1. No. 14 AWG, solid, copper-covered steel conductor.
 - 2. Gas-injected, foam-PE insulation.
 - 3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
 - 4. Jacketed with sunlight-resistant, black PVC or PE.
 - 5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.
- D. NFPA and UL Compliance: Coaxial cables shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles. Types are as follows:
 - 1. CATV Cable: Type CATV.

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2. CATV Plenum Rated: Type CATVP, complying with NFPA 262.

2.5 COAXIAL CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Emerson Network Power Connectivity Solutions; AIM Electronics Brand.
 2. Leviton Commercial Networks Division.
 3. Siemon.
- B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.6 LOW-VOLTAGE CONTROL CABLE

- A. Paired Cable: NFPA 70, Type CMG.
 1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with UL 1581.
- B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.
 1. One pair, twisted, No. 18 AWG, stranded (19x30) tinned copper conductors.
 2. PVC insulation.
 3. Unshielded.
 4. PVC jacket.
 5. Flame Resistance: Comply with NFPA 262.

2.7 CONTROL-CIRCUIT CONDUCTORS

- A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway.
- C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.8 IDENTIFICATION PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Brady Worldwide, Inc.
 2. HellermannTyton North America.
 3. Kroy LLC.
 4. Panduit Corp.

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- B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

2.9 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to evaluate cables.
- B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.
- C. Factory test UTP cables according to TIA/EIA-568-B.2.
- D. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.
- E. Cable will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 WIRING METHOD

- A. Install wiring in metal pathways and wireways.
 - 1. Minimum conduit size shall be 3/4 inch. Security control and data transmission wiring shall not share conduit with other building wiring systems.
 - 2. Comply with requirements in Section 260533 "Raceway and Boxes for Electrical Systems."
- B. Install cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring within Enclosures:
 - 1. Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.
 - 2. Install lacing bars and distribution spools.
 - 3. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer.
 - 4. Install conductors parallel with or at right angles to sides and back of enclosure.
 - 5. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks.
 - 6. Mark each terminal according to system's wiring diagrams.
 - 7. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

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3.2 INSTALLATION OF CONDUCTORS AND CABLES

- A. Comply with NECA 1.
- B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.
- C. General Requirements for Cabling:
 - 1. Comply with TIA/EIA-568-B.1.
 - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
 - 3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - 5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
 - 6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
 - 7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
 - 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- D. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with Category 5e rating of components and that ensure Category 5e performance of completed and linked signal paths, end to end.
 - 1. Comply with TIA/EIA-568-B.2.
 - 2. Install 110-style IDC termination hardware unless otherwise indicated.
 - 3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.
- E. Separation from EMI Sources:
 - 1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
 - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
 - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

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4. Separation between cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
 - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.3 POWER AND CONTROL-CIRCUIT CONDUCTORS

- A. 120-V Power Wiring: Install according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
- B. Minimum Conductor Sizes:
 1. Class 1 remote-control and signal circuits, No. 14 AWG.
 2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
 3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.4 FIRESTOPPING

- A. Comply with TIA-569-B, "Firestopping" Annex A.
- B. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A.

3.6 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
 2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

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- a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
- B. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.

END OF SECTION 280513

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SECTION 281600 – SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Intrusion detection with communication links to perform monitoring, alarm, and control functions.
 - 2. Integration of other electronic and electrical systems and equipment.

- B. Related Sections:

- 1. Division 28 Section "Conductors and Cables for Electronic Safety and Security" for cabling between master control units and field-mounted devices and control units.

1.3 DEFINITIONS

- A. PhySec: Chief, Physical Security Division.

- B. CCTV: Closed-circuit television.

- C. PIR: Passive infrared.

- D. RFI: Radio-frequency interference.

- E. UPS: Uninterruptible power supply.

- F. Control Unit: System component that monitors inputs and controls outputs through various circuits.

- G. Master Control Unit: System component that accepts inputs from other control units and may also perform control-unit functions. The unit has limited capacity for the number of protected zones and is installed at an unattended location or at a location where it is not the attendant's primary function to monitor the security system.

- H. Monitoring Station: Facility that receives signals and has personnel in attendance at all times to respond to signals. A central station is a monitoring station that is listed.

- I. Protected Zone: A protected premises or an area within a protected premises that is provided with means to prevent an unwanted event.

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- J. Standard Intruder: A person who weighs 100 lb or less and whose height is 60 inches or less; dressed in a long-sleeved shirt, slacks, and shoes.
- K. Standard-Intruder Movement: Any movement, such as walking, running, crawling, rolling, or jumping, of a "standard intruder" in a protected zone.
- L. Systems Integration: The bringing together of components of several systems containing interacting components to achieve indicated functional operation of combined systems.
- M. Zone. A defined area within a protected premises. It is a space or area for which an intrusion must be detected and uniquely identified. The sensor or group of sensors must then be assigned to perform the detection, and any interface equipment between sensors and communication must link to master control unit.

1.4 SUBMITTALS

- A. Product Data: Components for sensing, detecting, systems integration, and control, including dimensions and data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: Detail assemblies of standard components that are custom assembled for specific application on this Project.
 - 1. Functional Block Diagram: Show single-line interconnections between components including interconnections between components specified in this Section and those furnished under other Sections. Indicate methods used to achieve systems integration. Indicate control, signal, and data communication paths and identify programmable logic controllers, networks and control interface devices and media to be used. Describe characteristics of network and other data communication lines.
 - a. Indicate methods used to achieve systems integration.
 - b. Indicate control, signal, and data communication paths and identify PLCs, networks, control interface devices, and media to be used.
 - c. Describe characteristics of network and other data communication lines.
 - d. Describe methods used to protect against power outages and transient voltages including types and ratings of isolation and surge suppression devices used in data, communication, signal, control, and ac and dc power circuits.
 - 2. Raceway Riser Diagrams: Detail raceway runs required for intrusion detection, access control, duress, CCTV, and for systems integration. Include designation of devices connected by raceway, raceway type and size, and type and size of wire and cable fill for each raceway run.
 - 3. UPS: Sizing calculations.
 - 4. Site and Floor Plans: Indicate final outlet and device locations, routing of raceways, and cables inside and outside the building. Include room layout for master control-unit console, terminal cabinet, racks, and UPS.
 - 5. Master Control-Unit Console Layout: Show required artwork and device identification.
 - 6. Device Address List: Coordinate with final system programming.
 - 7. System Wiring Diagrams: Include system diagrams unique to Project. Show connections for all devices, components, and auxiliary equipment. Include diagrams for equipment and for system with all terminals and interconnections identified.
 - 8. Details of surge-protection devices and their installation.

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9. Sensor detection patterns and adjustment ranges.
- C. Equipment and System Operation Description: Include method of operation and supervision of each component and each type of circuit. Show sequence of operations for manually and automatically initiated system or equipment inputs. Description must cover this specific Project; manufacturer's standard descriptions for generic systems are unacceptable.
- D. Qualification Data: For Installer.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For intrusion detection system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 1. Data for each type of product, including features and operating sequences, both automatic and manual.
 2. Master control-unit hardware and software data.
- G. Warranty: Sample of special warranty.
- H. Other Information Submittals:
 1. Test Plan and Schedule: Test plan defining all tests required to ensure that system meets technical, operational, and performance specifications within 60 days of date of Contract award.
 2. Examination reports documenting inspections of substrates, areas, and conditions.
 3. Anchor inspection reports documenting inspections of built-in and cast-in anchors.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications:
 1. An employer of workers, at least one of whom is a technician certified by the National Burglar & Fire Alarm Association.
 2. Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Intrusion Detection Systems Integrator Qualifications: An experienced intrusion detection equipment supplier and Installer who has completed systems integration work for installations 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.
- C. Testing Agency Qualifications: Member company of NETA or an NRTL.
 1. Testing Agency's Field Supervisor: Currently certified by NETA to supervise on-site testing.
- D. 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.

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- E. Control Units, Devices, and Communications with Monitoring Station: Listed and labeled by a qualified testing agency for compliance with SIA CP-01.
- F. FM Global Compliance: FM-Approved and -labeled intrusion detection devices and equipment.
- G. Comply with NFPA 70.

1.6 PROJECT CONDITIONS

- A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
 - 1. Altitude: Sea level to 4000 feet.
 - 2. Master Control Unit: Rated for continuous operation in an ambient of 60 to 85 deg F and a relative humidity of 20 to 80 percent, noncondensing.
 - 3. Interior, Controlled Environment: System components, except master control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambients of 36 to 122 deg F dry bulb and 20 to 90 percent relative humidity, noncondensing.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace components of intrusion detection devices and equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: One year from date of Substantial Completion.

1.8 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Intrusion Detection Devices: Furnish quantity equal to five percent of the number of units of each type installed, but no fewer than one of each type.
 - 2. Fuses: Three of each kind and size.
 - 3. Tool Kit: Provide two sets of tools for use with security fasteners, each packaged in a compartmented kit configured for easy handling and storage.
 - 4. Security Fasteners: Furnish no fewer than 1 box for every 50 boxes or fraction thereof, of each type and size of security fastener installed.

PART 2 - PRODUCTS

2.1 INTRUSION DETECTION SYSTEMS

- A. The Contractor must design, procure, install, program, test, document and provide training for a complete TSA Office of Security approved Bosch intrusion detection system or approved equal turnkey system

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(i.e., Bosch 9412GV4 Intrusion Detection System and Hirsch System with Hirsch Velocity Access Control Software).

B. The Contractor will maintain and warranty the system for one (1) year after the acceptance date. The work will include, but may not be limited to the following:

1. Intrusion Detection Panel:

- a. The type of panel to be installed will be a Bosch D9412GV4 intrusion detection system. The installer must be a certified Bosch vendor who is experienced in programming the advanced software features associated with this panel and which is required for this security application.
- b. The host panel and all associated control equipment will be located in the Computer LAN/Server Room/Communications Room (refer to the floor plans for locations). A 360 degree (PIR) Sensor will be located inside of the LAN room. The IDS system will be standalone and not connected to the TSA network.
- c. All equipment serving the IDS/Access Control system will be wall-mounted on the wall of the Computer LAN/Server Room/Communications Room.
- d. Alarm Control Keypads Bosch D1265 Series touch-screen keypad or approved equivalent will be programmed to accept all password combinations and will have the capability to arm or disarm points designated as general office security points. PHYSEC will identify location in design intent or construction drawings.
- e. The Contractor is responsible to ensure selected vendor is competent and current on the Bosch D9412GV4 Intrusion Detection System and Hirsch System with Hirsch Velocity Access Control Software.
- f. The alarm system will notify, via a dedicated analog phone line provided by the local office, the respective/designated Federal Protective Service (FPS) Mega Center of the specified location, violations of the security system. It is the responsibility of the host office to ensure that there is a dedicated "Plain Old Telephone Line" (POTS) at each TSA location that has an approved security system installed.
- g. The alarm system must be provided sufficient battery back-up to remain operational for a minimum of four (4) hours in the event of a power failure.
- h. All intrusion detection devices will be centrally powered and monitored from the LAN Room.
- i. A generic or universal PIN code will not be used to access TSA or FAM facilities.
- j. The Contractor will be responsible for all the initial input of all user codes, HSPD-12 enrollment of all TSA personnel and completion of the FPS Mega Center Alarm Requirements Document (MARS) to be provided by the TSA Office of Security once the system has been installed and is ready for set-up and programming. Once the system is fully programmed, a copy of the Federal Protective Service (FPS) ALL EVENTS HISTORY REPORT will be provided to both FSD stall and TSA PSD at least 24 hours before arrival for system acceptance testing.

2. Intrusion Detection Sensors:

- a. All devices will operate from 12VDC. Provide (necessary number to cover leased space) Bosch DS9360° panoramic Tri Tech ceiling-mounted 360 degree, motion detector or equal where specified and approved by TSA Office of Security.
- b. Provide recessed magnetic ¾-inch door contact switches, Sentrol 1078C or equal where specified and approved by TSA Office of Security.

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- c. Provide overhead door contact switches, Sentrol 2200 or equal where specified and approved by TSA Office of Security.
 - d. Provide balanced magnetic switches for perimeter doors to collateral open storage spaces containing classified information, Harco HSD p/n 30000-00000-000.
3. Detector Cable Requirements:
- a. All detectors will be connected via homeruns from the point of detection back to the IDS/Access Control Panel located in the LAN/Server Room.
 - b. Utilize Belden cable 8444, 2 pair, twisted cable, 22 gauge, CAT 5 or PHYSEC will specify equivalent.
 - c. All cable runs through conduit will require an additional pull string for future expansion and versatility.
4. Duress Alarm:
- a. Utilize Belden cable 8444, 2 pair, twisted cable, 22 gauge, CAT 5, or TSA Office of Security-specified equivalent. The duress alarm button will be installed within reaching distance of the receptionist seating area so that it can be used covertly in an event of an emergency situation or event. The duress alarm button will be connected to and report as a Duress Alarm (on a dedicated zone or alarm point) through the IDS.
 - b. Signage will be erected inside TSA offices to advise of Duress/Strobes and procedures to follow: **"DO NOT OPEN DOOR IF STROBE IS ACTIVE!"**

2.2 ACCESS CONTROL

A. Electronic Access Control System:

1. The vendor selected by the Contractor to install this system must be a certified installer of the Access Control System.
2. Utilize Belden cable 8444, 2 pair, twisted cable, 22 gauge, CAT 5, or PHYSEC specified equivalent.
3. The selected vendor will have a full understanding of all current hardware and software applications.
4. Entry points of various levels of access and security requirements must be installed.
5. The Electronic Access Control System will work through the Intrusion Detection System Alarm Panel described above (Bosch/Radionics 9412GV4).
6. Hirsch Model DS47L-SSP-HID card readers will be installed to momentarily unlock the electronic strike while shunting the alarm and providing access control to the facility. Connect card readers to the Hirsch Digi-TRAC controller.
7. The following type of Hirsch mounting boxes will be used:
 - a. MB8 (ADA – preferred).
 - b. MB9 (ADA).
 - c. UMK Slope (ADA).
 - d. MB2SL (ADA).
 - e. MB20 (ADA).
8. All installation will utilize user-defined PINS.

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9. Contractor will be responsible for all initial input of user-specified PINs and hand-carried media (fob/card) to meet the requirements of multifactor authentication.
10. Where airports utilize an access control card, all efforts should be made to allow users to utilize their issued access control media and PIN.
11. No perimeter or interior door will require or utilize any configuration of "Request-to-Exit" (REX) technology, other than for shunting the perimeter alarm system or where building construction requirements and/or local codes do not permit the use of capacitance push-bars or exit buttons.
12. The Hirsch Velocity Access Control System will have the capability to assign and at least 132,000 credentials per Hirsch.

B. Door Strikes:

1. Provide an electronic door strike.
2. All door strikes will be 24 Volts AC/DC or 12 Volts AC/DC.
3. All door strikes installed on all floors will be centrally powered from the LAN/Server Room.
4. All doors with use the Folgers Adam Model 310-3-1 electronic door strike or approved equal.
5. All doors without a deadbolt will utilize the Folders Adam Model 310-2 ¾ electric door strike or approved equal.

C. Electromagnetic Locks:

1. Provide an electromagnetic lock (MAG lock). Use Dyna Lock 3000 Series electromagnetic lock or approved equivalent.
2. All MAG locks will be 24 Volts AC.
3. All MAG locks installed on all floors are required to be centrally powered from the LAN/Server Room.
4. All MAG locks are required to provide sufficient battery back-up to remain operational for a minimum of four (4) hours in the event of a power failure.
5. All MAG locks will be installed in accordance with local building codes.
6. Intrusion Detection System (IDS) and Access Control System (ACS) must be integrated to ensure door props and forced entry alarms on access controlled doors.
7. The system will be programmed to report forced entry and/or a "prop open" alarm to the IDS system.
8. The installer will provide, as part of the installation, a Hirsch Client Management Station (Hirsch computer, monitor, reader, and server).
9. Contractor will provide training to multiple TSA personnel to enroll, update, and remove persons in the Hirsch system. NOTE: More than one person is to be trained to prevent single point of failure. At least three (3) hours of training will be conducted to ensure the local office is trained in the use and operation of all systems. Training one time upon installation will be conducted locally on-site and will ensure that there are an adequate number TSA personnel trained to Arm/Disarm and use the system correctly. Documentation that training was conducted to include class roster will be provided to the Federal Security Director (FSD)/Manager at location and also provided to TSA PSD.

2.3 VIDEO INTERCOM/DOOR ANSWERING SYSTEM, AIPHONE INCLUDING DOOR RELEASE

- A. Contractor or Lessor will purchase, install, program, maintain, and test a turn-key Aiphone JK-1MED, or equivalent. (Note: Equivalent Video Intercom/Door Answering System must be approved by PHYSEC.) The Contractor or Lessor will provide authorized installers to install, program, maintain, and test the

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system. All equipment must be installed according to manufacturer's specifications. All conduit sizing and wiring requirements are the responsibility of the Contractor or Lessor.

- B. The Video Intercom/Door Answering System will have the capacity for additional door stations, either audio/video or audio only and up to two additional interior stations, either audio/video or audio only.
- C. The external door station (outside door) must be a one-piece unit equipped with a CCD (Charged Coupled Device) chip camera with infrared LEDs (Liquid Electronic Displays) for low light applications. Pan/tilt mechanism adjustable by an interior monitor, call-in button, speaker/microphone for communication, and a locator LED. The call-in button on the external door station will turn on the 3/12-inch TFT color LCD at the inside monitor that initiates audio monitoring from the door and activates a two- or four-stroke chime. Audio communication at the external door station must be hands-free, and communication at the inside station must be through the handset.
- D. The interior monitor station must be a one-piece unit equipped with a 3-1/2" flat TTF TFT color LCD monitor, a monitor activation button, a pan and tilt control pad, door release button, secondary dry contact (optional), an all call button, call-in indicator LED, and a handset for private communication. Brightness and chime volume controls must be located in each of the monitoring units. The entry area must have the ability to be monitored by pressing the "monitor" button on any room station. This allows both audio and video monitoring, staying on for approximately 45 seconds. The interior stations must also be able to normally open a dry contact for door release and an extra dry contact for light or secondary door release activation.
- E. Technical Specifications:
 - 1. System: JK 1-MED Series; hands-free color video with pan tilt and zoom.
 - 2. Power Source: 18V DC. Use PS-1820UL.
 - 3. Communication:
 - a. Automatic (hands-free): To activate, momentarily push Talk button.
 - b. Talk Button, Manual (push-to-talk/relase-to-listen): To activate, push Talk button for 1 second or until talk LED turns on.
 - 4. Calling: Chime, image, and audio approximately 45 seconds.
 - a. Between Inside Stations: All Call tone, then communicate with handset.
 - 5. Video: Monitor; 3-1/2-inch direct-view TFT color LCD with 525 scanning lines.
 - 6. Camera Unit: CCD (Charged Coupled Device) with infrared LED illumination.
 - 7. Minimum Illumination: 5 lux at 1'-5/8" distance.
 - 8. Night Viewing: Up to 1'-5/8" from camera with white LED projected, background beyond 1'-5/8" cannot be seen.
 - 9. Wiring:
 - a. Door to Master: 2-cond., mid-cap, solid, non-shielded.
 - b. Master to Sub: 4-cond., mid-cap, solid, non-shielded.
 - c. Wiring Distance:
 - 1) Door to Farthest Master/Sub-Master: 165 feet (22 AWG); 330 feet (18 AWG).
 - 2) Master to IER-2: 245 feet (22 AWG); 490 feet (18 AWG).

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- d. Wire Type:
 - 1) Master to Door: Aiphone #871802.
 - 2) Between Masters/Sub: Aiphone #871804.
- e. Mounting: Surface mount to a 1-gang box or ring.
- f. Door Release Contact: Normally open, 12V AC, 0.4A max.

2.4 CCTV SYSTEMS

A. Closed Circuit TV (CCTV) Digital Video Recorder (DVR) Systems:

1. Where required, the Contractor is responsible for obtaining, installing, programming and testing a complete turn-key CCTV system approved by PHYSEC. The Contractor will maintain and warranty the system for one year after the acceptance date.
2. All installed CCTV cameras will be monitored at the reception desk and/or tenant specified location. The monitor(s) must be set up to display all cameras in a continuous loop and wired into the supplied Digital Video Recorder (DVR).
3. The CCTV cameras will be fixed mount and fixed zoom inside a smoke dome housing and must be installed so as to view and record all activity and persons entering/exiting TSA office space.
4. System hardware will include Contractor-provided:
 - a. Fixed mount all-weather IR/CCTV cameras Bosch Model WZ45 or approved equivalent.
 - b. Recording for a minimum of 25 days at 15 frames per second. Minimum 2 TB system.
 - c. Three 32-inch LCD wide screen color monitors. Locations specified on drawings.
 - d. All necessary hardware, wiring, power supplies.
 - e. Cameras.
5. Signage must be placed on interior of all perimeter doors indicating that property is protected by electronic video surveillance.

B. LAN Room:

1. The Alarm Control Panel (ACP), which is typically located in the LAN/Server Room should be located within 400 feet of any door employing any of the Intrusion Detection Systems or Electronic Access Control Systems components. A 360° Passive Infrared (PIR) motion sensor will be installed inside all LAN rooms. This space will be a separate zone on the Bosch panel or other approved system. LAN Room is specified as Information Security Restricted Areas (ISRA). All entry locations will use multifactor authentication access control (e.g., card key and PIN) to access the area.
2. Signage: Sensitive areas (e.g., rooms containing information system servers, controlled interface equipment, associated peripherals, communication equipment, etc.) or areas where restricted actions occur (e.g., information assurance monitoring, system administration, etc.) will be deemed an Information Security Restricted Area (ISRA) and clearly labeled as an "Information Security Restricted Area."

C. Kaba E-PLEX 5800 Series (as designated by FSD Staff):

1. The E-PLEX 5800 Door Control System will work as a standalone system.
2. The key-operated lock housing must accept a Medeco UL 437 M-3 interchangeable core.

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3. M3 cores must be "large format" to fit in the Kaba E-PLEX. The client's identity (TSA) and where the locks are installed will be not be divulged except as agreed upon by TSA.
4. The E-PLEX Door Control System will have the capability to assign and monitor no fewer than 3000 unique Personal Identification Numbers (PIN).
5. The E-PLEX Door Control System will have the capability to assign and monitor no fewer than 3000 HSPD-12 (PIV) cards. System will include KAVA E-PLEX FIPS general implementation kit and enrollment station laptop PC, commercial, off-the-shelf, not TSA networked, and E-PLEX 5800 FIPS/DES Fire Card Reader/Enroller and E-PLEX 5800 General FIPS software.
6. LPM-1000 Lock Programming Module with FIPS 201 Enroller.
7. The Contractor will be responsible for all programming including the initial input of user data and codes and completion of the tracking spreadsheet document. All TSA employees will be programmed into E-PLEX 5800 with HSPD12 card and unique PIN # for each employee.
8. Contractor will provide training to TSA personnel to enroll and remove persons at the lock. NOTE: More than person is to be trained to prevent single point of failure. At least three hours of training will be provided on operation of KABA 5800 at airport locations and/or adjacent offices as needed.
9. Contractor will provide documentation from KABA showing proof of certification to install and program the E-PLEX.

D. Security System Installer Information Requirements:

1. Upon request by the TSA Office of Security, the local TSA staff, or OSO, Compliance Surface Inspections, the Contractor will be required to provide the following information about the Contractor's employees and subcontractors who may have direct or incidental access to information being provided by the TSA:
 - a. Employee's full name.
 - b. Employee's date and place of birth.
 - c. Employee's social security number.
 - d. Employee's race and sex.
 - e. Complete fingerprint card.
 - f. General Release of Information document.
2. The Contractor is required to use GSA schedules and/or other government discounts when purchasing equipment or services on behalf of the TSA.
3. All program software and written materials pertaining to the security/access control system and related devices will be turned over to the TSA Office of Security, to include:
 - a. Detailed line item cost proposals.
 - b. Product specification sheets.
 - c. Inventory lists.
 - d. Operating and installation instructions.
 - e. As-built drawings.
 - f. Key cut and pinning charts for locking system.
4. All questions pertaining to the security devices and their operation must be directed to the TSA Office of Physical Security. **Under no circumstances will Statements of Work (SOW) written by the TSA Office of Security, Physical Security Division be changed or modified without the express written permission of this office.**

E. Contractor is responsible for the following:

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1. All conduit sizing and installation are the responsibility of the Contractor, if required by the facility.
2. Complete system with Hirsch Model DS47L-SSP-HID card readers, computer, and enrollment station.
3. Bosch D9412GV4 Intrusion Detection System and duress buttons with strobes to include strobes mounted outside TSA spaces to alert LAS airport of duress activation.
4. Bosch D1265 Touch Screen Keypad/Disarm Keypads connected to Bosch D9412GV4 Intrusion Detection System.
5. Bosch DS9360 Ceiling-Mount Panoramic TriTech Motion Detectors connected to Bosch D9412GV4 Intrusion Detection System.
6. Door Contact Switches Bosch D9412GV4 Intrusion Detection System.
7. Folgers Adam Model 310-3-1 and 310-1-2/3 electronic door strikes or HES equivalent on doors.
8. Complete, turn-key CCTV/DVR system (to include cameras).
9. Heavy-duty door closers for all doors.
10. All wiring and hardware.
11. Installation of all security systems and/or devices will be in accordance with manufacturer's requirements.
12. The personnel installing and programming security systems will be certified and current with the manufacturer.
13. All locksmith personnel installing, keying, pinning locks and other security devices will be certified, and current with the manufacturer.
14. Copies of all certifications and/or completed training will be available for review on-site.
15. Contractor will submit to TSA CSO a detailed line item cost breakdown for all security material and employee hours billed to the United States Government. Contractor will provide a detailed installation schedule to TSA CSO as part of the proposal submitted by the Contractor. Contractor will also immediately advise TSA CSO in writing of any delays.
16. The United States Government has the right to inspect and test all supplies called for in the contract, to the extent practicable, at all places and times and in any event before acceptance in any manner that does not unduly delay the work.
17. The only person authorized to accept completion of security system installation projects on behalf of the United States Government/Transportation Security Administration (TSA) is an Inspector SV 1801 who is also current and certified as a Contract Officer's Representative (COR) with certifications on file with TSA Office of Acquisitions.
18. During the acceptance phase, the Contractor will provide a binder with copies of manufacturer brochures and any floor plans or drawings for all security systems and/or devices installed.
19. Substitution of security systems and/or devices with "equivalent", "same as", or other terms in this manner is not authorized unless approved by the COTR, prior to installation.
20. The COR is not authorized to delete, change, waive, or negotiate any of the technical requirements or other terms and conditions of the contract. Should a change (monetary or otherwise) to the contract become necessary, it must be made by a contract modification issued by the Contracting Officer.

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 intrusion detection.

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- B. Examine roughing-in for embedded and built-in anchors to verify actual locations of intrusion detection connections before intrusion detection installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of intrusion detection.
- D. Inspect built-in and cast-in anchor installations, before installing intrusion detection, to verify that anchor installations comply with requirements. Prepare inspection reports.
 - 1. Remove and replace anchors where inspections indicate that they do not comply with requirements. Reinspect after repairs or replacements are made.
 - 2. Perform additional inspections to determine compliance of replaced or additional anchor installations. Prepare inspection reports.
- E. For material whose orientation is critical for its performance as a ballistic barrier, verify installation orientation.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SYSTEM INTEGRATION

- A. Integrate the following systems and equipment:
 - 1. Electronic door hardware.
 - 2. Intercommunications and program systems.
 - 3. Access control.
 - 4. Fire-alarm system.
 - 5. Perimeter security system.
 - 6. Video surveillance.

3.3 SYSTEM INSTALLATION

- A. Comply with UL 681 and NFPA 731.
- B. Equipment Mounting: Install master control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
- C. Install wall-mounted equipment, with tops of cabinets not more than 72 inches above the finished floor.
 - 1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

3.4 WIRING INSTALLATION

- A. Wiring Method: Install wiring in metal raceways according to Division 26 Section "Raceway and Boxes for Electrical Systems." Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 1/2 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

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- B. Wiring Method: Cable, concealed in accessible ceilings, walls, and floors when possible.
- C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Wires and Cables:
 - 1. Conductors: Size as recommended in writing by system manufacturer unless otherwise indicated.
 - 2. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.
 - 3. Control and Signal Transmission Conductors: Install unshielded, twisted-pair cable unless otherwise indicated or if manufacturer recommends shielded cable, according to Division 28 Section "Conductors and Cables for Electronic Safety and Security."
 - 4. Data and Television Signal Transmission Cables: Install according to Division 28 Section "Conductors and Cables for Electronic Safety and Security."
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- F. Install power supplies and other auxiliary components for detection devices at control units unless otherwise indicated or required by manufacturer. Do not install such items near devices they serve.
- G. Identify components with engraved, laminated-plastic or metal nameplate for master control unit and each terminal cabinet, mounted with corrosion-resistant screws. Nameplates and label products are specified in Division 26 Section "Identification for Electrical Systems."

3.5 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with identification requirements in Division 26 Section "Identification for Electrical Systems."
- B. Install instructions frame in a location visible from master control unit.

3.6 GROUNDING

- A. Ground the master control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to master control unit.
- B. Ground system components and conductor and cable shields to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.

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3.7 FIELD QUALITY CONTROL

- A. Pretesting: After installation, align, adjust, and balance system and perform complete pretesting to determine compliance of system with requirements in the Contract Documents. Correct deficiencies observed in pretesting. Replace malfunctioning or damaged items with new ones and retest until satisfactory performance and conditions are achieved. Prepare forms for systematic recording of acceptance test results.
 - 1. Report of Pretesting: After pretesting is complete, provide a letter certifying that installation is complete and fully operable; include names and titles of witnesses to preliminary tests.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections: Comply with provisions in NFPA 731, Ch. 9, "Testing and Inspections."
 - 1. Inspection: Verify that units and controls are properly labeled and interconnecting wires and terminals are identified.
 - 2. Test Methods: Intrusion detection systems and other systems and equipment that are associated with detection and accessory equipment shall be tested according to Table "Test Methods" and Table "Test Methods of Initiating Devices."
- E. Documentation: Comply with provisions in NFPA 731, Ch. 4, "Documentation."
- F. Tag all equipment, stations, and other components for which tests have been satisfactorily completed.

3.8 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose. Visits for this purpose shall be in addition to any required by warranty.

3.9 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain the systems as outlined in each section.

END OF SECTION 281600

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SECTION 283111M - FIRE ALARM SYSTEM MODIFICATIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Scope: Provide a fire alarm system modification, with associated equipment, ready for operation.
- B. Description of Work: The majority of work includes designing and installing new fire alarm devices as described herein and on the contract drawings for the TSA Tenant renovation and fit-out on the Second Floor of the Portland Jetport building in Portland, Maine. The new design and installation includes all wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm and supervisory signal initiating devices, alarm indicating devices, and all other accessories and miscellaneous items required for a complete operating system. In addition, the following items must be incorporated into the project:
1. Provide new fire alarm speakers (wall mounted for the project area shown on the drawings) to provide adequate coverage and distribution to ensure the audibility sound level requirements in NFPA 72 are met. The new fire alarm speakers shall be compatible with the building's existing fire alarm system. Depending on the layout, additional power supplies may be required. To ensure audible signals are clearly heard, the sound level shall be at least 70dBA throughout the project area (see drawings). The quantities and locations of fire alarm speakers shown on the drawings are for cost estimating purposes only. Additional speakers shall be provided, if necessary, to meet minimum sound level requirements specified above.
 2. Provide new fire alarm strobes for the project area to provide adequate coverage and distribution to ensure the visibility level requirements in NFPA 72 are met. The new fire alarm strobes shall be compatible with the building's existing fire alarm system. Provide all required auxiliary power supply panels, conduit, wiring, control devices, software, programming, etc. to provide a fully functional system in accordance with NFPA 72 requirements. Combination speaker/strobes are acceptable.
- C. Existing Fire Alarm Equipment: Maintain existing fire alarm equipment outside of any area(s) under construction fully operational. Furthermore, as necessary for tie-ins, the existing fire alarm system and equipment can be taken out of service only during construction periods in which the system is being modified and the Contractor is at the work-site. Prior to leaving the work-site each day the Contractor shall restore the fire alarm system to service. All new devices installed shall be compatible with the existing fire alarm system.
- Maintain existing fire alarm equipment fully operational. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted.
- D. Equipment Removal: Remove all existing equipment not to be reused, including wiring, raceways, conduit, boxes, cabinets, outlets, mounting boxes and other devices, and restore all damaged surfaces as specified herein. Remove the remainder of the existing materials from the site and dispose of them.
- E. Compliance: Design and install the entire fire alarm system in accordance with Section 1.2E of this specification, except where modified herein. All equipment and materials used shall be listed or

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approved by UL, FM, or another nationally recognized testing agency approved by the Contracting Officer, for their intended use and service.

F. Related Sections and Divisions:

1. Refer to these Division 16 specifications for related guidance:
 - a. Cable
 - b. Wire
 - c. Raceways
 - d. Connectors
2. Refer to this Division-7 specification for related guidance:
 - a. Firestopping

1.2 QUALITY ASSURANCE

- A. Specialist Requirements: Design shall be by a Registered Fire Protection Engineer or by a NICET Level III or IV Technician and certified by a Registered Fire Protection Engineer. Installation must be performed by an electrical contractor with at least three (3) years experience in the design and installation of fire alarm systems. Design and installation must be performed by an electrical contractor whose business is located within 75 miles of Portland, ME and whose business has been operated and established within this radius for at least three (3) years.

Prior to installation, the contractor must submit the following:

1. Data showing that the contractor has successfully installed fire alarm systems of the same type and design as specified herein; or, that the contractor has a firm contractual agreement with a subcontractor having such experience;
 2. The names and locations of at least two installations where the contractor or subcontractor installed such systems; and
 3. Data certifying that each system has performed satisfactorily for a period of not less than one year.
- B. Project Superintendent: The contractor, or subcontractor, shall provide one full-time, on-site staff member designated as the "Project Superintendent". The duties of the Project Superintendent are to supervise execution of all aspects of this specification, including safety on the job site as described in the "Accident Prevention Clause" of the general provisions of the Occupational Safety and Health (OSH) Act of 1970. That clause incorporates into the contract, by reference, the Secretary of Labor's OSH Standards (29 CFR Part 1926). The Project Superintendent shall be thoroughly familiar with all contract obligations and shall be capable of making all contractual decisions with regards to their project scope of work on behalf of the contractor, or subcontractor. The Project Superintendent shall be responsible for making sure that quality control review has been performed on all submittals prior to the submission to the contracting officer. The Project Superintendent shall also be responsible for ensuring that all submittals are accurate and fully coordinated.
- C. Service Organization: The contractor shall furnish evidence that there is an experienced and effective service organization that carries a stock of repair parts for the system to be furnished. Should the

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contractor fail to comply with the service requirements of this section, the government will then have the option to make the necessary repairs and back charge the contractor without any loss of warranty or guarantee as provided by the contract documents.

- D. Guarantee: All equipment and materials provided under this contract must be new. The contractor shall guarantee labor, materials, and equipment provided under this contract against defects for a period of one year after the date of final acceptance of this work by the government and the receipt of as-built drawings and schematics of all equipment. Replacement parts for the system furnished under this contract shall be available for at least ten years after the date of final acceptance of this work by the Government.
- E. Codes and Standards: Provide a fire alarm system conforming to the latest editions of codes and standards of the following organizations:
1. National Fire Protection Association (NFPA), including all amendments and appendices:
NFPA No. 70: National Electrical Code (NEC)
NFPA No. 72: National Fire Alarm Code
 2. Factory Mutual Engineering and Research Corporation (FM):
FM-P7825 Approval Guide
 3. Underwriter's Laboratories Inc. (U.L.):
UL-FPED Fire Protection Equipment Directory
UL Electrical Construction Materials Directory
UL 217 Single and Multiple Station Smoke Detectors
UL 268 Smoke Detectors for Fire Protective Signaling Systems
UL 864 Control Units for Fire Protection Signaling Systems
UL 1971 Signaling Devices for the Hearing Impaired
 4. Other GSA-approved testing laboratories
 5. International Code Council (ICC) International Code Council (ICC), including all supplements:
International Building Code
International Fire Code
 6. GSA Facilities Standards for the Public Buildings Service – PBS-P100
 7. Maine Uniform Building and Energy Code
 8. Portland Fire Department Requirements

1.3 DEFINITIONS

- A. General: Wherever mentioned in this specification or on the drawings, define the equipment, devices, and functions as follows:
1. Alarm Signal: A signal indicating an emergency requiring immediate notification of the fire department and of the building occupants. These are signals such as:
 - a. The activation of a manual pull station.

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- b. The activation of a waterflow switch from a sprinkler system.
 - c. The activation of a ceiling-mounted spot-type smoke detector after it has undergone alarm confirmation.
2. Supervisory Signal: A signal indicating the impairment of a fire protection system that may prevent its normal operation. These are signals such as the operation of a valve tamper switch, low air pressure switch, duct smoke detector, etc.
 3. Trouble Signal: A signal which indicates that a fault, such as an open circuit or ground, has occurred in the system, or that the system has lost power.
 4. Class A Wiring: Class A circuits are electrically supervised such that a single break or single ground fault condition will be indicated by a trouble signal on the fire alarm control panel (FACP). The circuit shall be capable of operation for its intended service with a single break or ground fault no matter where the break or ground fault condition occurs.
 5. Class B Wiring: Class B circuits are electrically supervised such that a single break or a single ground fault condition will be indicated by a trouble signal on the FACP no matter where the break or ground fault condition occurs.
 6. Verified Smoke Detection: The use of a smoke detection system with an alarm verification process. The verification process interrupts the transmission of an alarm signal from a smoke detector for a designated time period (less than one minute). Immediately following the interruption period, if the smoke detector is still in alarm, an alarm signal will be sent to the control panel to initiate the next event in the sequence of operation.

1.4 SYSTEM OPERATION

- A. General: The building's existing fire alarm system operation shall remain unchanged except for the relocation of existing and/or the installation of the new fire alarm devices as indicated on the drawings and specified herein.
 1. A minimum of two (2) distinct fire alarm audible notification appliance circuits and a minimum of two (2) distinct visible notification appliance circuits shall be provided. The system must be designed and installed so that a single wire to wire short or any other single Class B impairment on an audible or visible NAC does not affect more than one half of the area.

1.5 ELECTRICAL SUPERVISION

- A. System Supervision: Provide a system having electrical supervision in accordance with NFPA 72. Indicate an open on a circuit by zone with a trouble signal at the FACP. Indicate a ground fault by a trouble signal at the FACP.
 1. Provide Class B notification appliance circuit such that a single fire will not affect more one half of the area.

1.6 SUBMITTALS

- A. Division 1: Conform to the requirements of Division-1 Section "Submittals." Submit 6 complete sets of submittals. Partial submittals will not be accepted and will be returned without review. All submittals

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must be signed/stamped by the individual who designed the system. Before any work is started, the engineer of record must approve the submittal.

In the submittal, provide manufacturer's data for the following and annotate the data to show the specific model, voltage, catalog numbers, type, etc.

1. Fire Alarm Audio Devices (Speakers)
2. Fire Alarm Strobes
3. All Wiring
4. All Conduit
5. Auxiliary Power and/or Control Panels
6. Terminal Cabinets

B. Shop Drawings: Submit detailed shop drawings, on uniform size sheets no smaller than 30 by 42 inches, to the Contracting Officer for review and approval. Before any work is started, the engineer of record must approve the shop drawings. Provide the following on the shop drawings:

1. Complete schematic circuit diagrams for all equipment including panel modules.
2. Point-to-point wiring diagrams showing the points of connection and terminals used for all electrical field connections in the system. Include all interconnections between the fire alarm control panel and all new equipment, devices, or systems that are supervised or controlled by the system. Diagrams shall show all connections from the new field devices to the control panel, initiating and indicating circuits, switches, relays and terminals.
3. A complete description of the system operation. In detailed narrative form, explain how the system will operate/function upon activation of the various alarm initiating devices such as pull stations, sprinkler system waterflow switches, sprinkler system control valve tamper switches, elevator lobby smoke detectors, air-handling unit smoke detectors, etc. All events that will automatically occur upon activation of any of these different devices shall be fully explained and detailed in writing.
4. A schedule of zones.
5. Complete battery calculations for both the alarm and supervisory power requirements. Submit ampere-hour requirements for each system component with the calculations.
6. Complete riser diagrams indicating the wiring sequence of all new devices and their connections to the control equipment. Provide a color code schedule for the wiring. Provide floor plans showing the location of all devices and equipment.

1.7 AS-BUILT DRAWINGS

A. General: Submit to the Contracting Officer 6 sets of detailed "as-built" drawings. The drawings shall include complete wiring diagrams showing connections between all devices and equipment, both factory and field wired. Include a riser diagram and drawings showing the as-built location of all devices and equipment. The drawings shall show the system as installed, including all deviations from both the project drawings and the approved shop drawings. The drawings shall also include all information as required by NFPA 72. Submit the drawings on uniform-sized sheets not less than 30 by 42 inches. Submit these drawings within two weeks after the final acceptance test of the system.

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1.8 OPERATION AND MAINTENANCE MANUALS

- A. General: Not less than thirty days prior to the final acceptance testing of the entire system, and for use during the instruction period hereinafter specified, provide 6 bound copies of an operation and maintenance manual to the Contracting Officer. The manual shall include an index, copies of all approved shop drawings and submittal materials (updated to as-built), and a complete parts list of all components. The manual shall also include, for each item, the manufacturer's name, the serial number of the part, an ordering number, if appropriate, and a physical and electrical description of the part. The manual shall also include a list of recommended spare parts.
- B. Record Drawing Software: Provide one (1) set of CAD based drawings in DWG format of all as-built drawings and schematics.

1.9 INSTRUCTION OF GOVERNMENT EMPLOYEES

- A. Due to the limited changes in programming, no instruction is required.

PART 2 - PRODUCTS

2.1 ALARM INDICATING DEVICES

- A. Fire Alarm Speakers: Provide fire alarm speakers conforming to UL 1480 having a minimum of four (4) tap settings and separate terminations for each "in" and "out" connection. At a minimum, tap settings shall include taps of 1/4, 1/2, 1 and 2 watts. Speakers shall be initially set at the 1/2 watt tap setting; however, setting shall be adjusted to meet sound pressure requirements. Speakers shall have an output rating of 84 dBA at three (3) meters (9.9 feet) as determined by the reverberant room test; data on peak output as determined in an anechoic chamber is not suitable. All speakers shall be capable of installation on standard 100 mm (4 inch) square electrical boxes. Where speakers and strobes are provided in the same location, they may be combined into a single wall or wall/ceiling mounted unit.

To ensure audible signals are clearly heard, the sound level shall be at least 70 dBA throughout the office spaces, courtrooms, general building areas and corridors measured 1.5 meters (5 feet) above the floor. The sound level in other areas shall be at least 15 (fifteen) dBA above the average sound level or five (5) dBA above any noise source lasting 60 seconds or longer. Sound level measurements shall be taken with room doors closed. Quantities of fire alarm speakers shown on the contract drawings are for cost estimating purposes only. Additional speakers shall be provided at no additional expense to the government if the sound levels noted above are not achieved during the final acceptance testing.

- B. Fire Alarm Strobes: Provide visual alarm appliances (strobes) that operate on a supervised twenty-four (24) volt D.C. circuit. The strobe lens shall comply with UL 1971 and conform to the Americans with Disabilities Act. All strobes shall incorporate circuitry for synchronized strobe flash. The strobe intensity shall have a minimum of four field selectable settings and shall be rated per UL Standard 1971 with a flash rate of one (1) flash per second minimum across the listed voltage range. The strobes shall not drift out of synchronization at any time during operation. The strobe shall have a Xenon flash tube. The strobe shall have a red cover plate.

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Provide synchronization modules on strobe light circuits, and/or synchronized power supplies, as necessary, to ensure strobe lights are synchronized in any vertical or horizontal line of sight, in accordance with NFPA 72

- C. Combination Speaker/Strobe Units: Combination units may be used provided that the requirements in A. and B. are separately met for the speaker and strobe utilized in the combined unit.

PART 3 - EXECUTION

3.1 SYSTEM FIELD WIRING

- A. Wiring Within Cabinets, Enclosures, Boxes and Fittings: Provide wiring installed in a neat and workmanlike manner and installed parallel with or at right angles to the sides and back of any box, enclosure or cabinet. All conductors that are terminated, spliced, or otherwise interrupted in any enclosure, cabinet, mounting or junction box shall be connected to terminal blocks. Mark each terminal in accordance with the wiring diagrams of the system. Make all connections with approved terminal blocks.
- B. Alarm Wiring: Provide minimum No. 16 AWG (use larger conductors where recommended by the fire alarm system or product manufacturers and/or if necessary to provide proper system operation and to avoid excessive voltage drops during operation) solid copper conductors with 600 volt 90 degrees C rated insulation in dry locations and 600 volt 75 degrees C insulation in wet or damp locations. Provide wiring operating at 120 VAC as minimum No. 12 AWG solid copper having similar insulation. Install all conductors in rigid metal conduit or electrical-metallic tubing, utilizing compression type fittings and couplings, with a minimum diameter of 3/4 inches. Run conduit or tubing concealed in finished areas unless specifically shown otherwise on the drawings. Run conduit or tubing concealed unless specifically shown otherwise on the drawings. All wiring for the fire alarm system must be installed in separate conduit. No other building wiring is permitted in conduit that contains fire alarm wiring. Pigtailing and "T-tapping" are not permitted.
- C. Color Coding: Color all wiring differently from the normal building wiring. Use two different colors for alarm indicating circuits, for each type of initiating device circuit, and for each type of supervisory circuit. The distinctive color code for each function shall remain the same throughout (e.g. changes in colors are not permitted).

3.2 FIRESTOPPING

- A. General: Firestop all holes for conduit, piping, or other penetrations which pass through floor slabs, fire-rated walls, partitions with fire-rated doors, vertical service shafts, or any fire-rated assemblies in accordance with Section 07270, Firestopping.

3.3 INSTALLATION

- A. Alarm Indicating Devices: Locate alarm indicating devices where shown on the drawings. All devices shall be flush-mounted.

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3.4 TESTS

- A. Loop Resistance Tests: Measure and record the resistance of each circuit with each pair of conductors in the circuit short-circuited at the farthest point from the circuit origin. The tests shall be witnessed by the Contracting Officer and test results recorded for use at the final acceptance test.
- B. Preliminary Testing: Conduct preliminary tests to ensure that all devices and circuits are functioning properly. Tests shall meet the requirements of Paragraph 3.5 of this section. After preliminary testing is complete, provide a letter certifying that the installation is complete and fully operational. The letter shall confirm that each initiating and indicating device was tested in place and functioned properly. The letter shall also confirm that all panel functions were tested and operated properly. The letter shall include the names and titles of the witnesses to the preliminary tests. The contractor and the representative from each supplier of equipment shall be in attendance at the preliminary test to make necessary adjustments. The Contracting Officer must be present at the preliminary test.
- C. Final Testing: Notify the Contracting Officer in writing when the system is ready for final acceptance testing. Submit request to Contracting Officer for testing at least 15 calendar days prior to test date. A final acceptance test will not be scheduled until operation and maintenance manuals have been received by the Contracting Officer. Submit up-to-date redlined shop drawings to the Contracting Officer at the final test. These drawings shall be undamaged sets of prints of the shop drawings, with changes from the original drawings marked in red.

The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the final test. The final test shall be witnessed by the authority having jurisdiction. At the final test, any and all required tests shall be repeated at the discretion of the Government.

3.5 MINIMUM SYSTEM TESTS

- A. General: Test the system in accordance with the procedures outlined in NFPA 72. The required tests are as follow:
 - 1. Verify the absence of unwanted voltages between circuit conductors and ground.
 - 2. Verify the control unit is in the normal condition as detailed in the manufacturer's operating and maintenance manual.
 - 3. Test each initiating and indicating device and circuit for proper operation and response at the control unit.
 - 4. Test the system for all specified functions in accordance with the contract's plan and specifications and the manufacturer's operating and maintenance manual.
 - 5. Determine that the system is operable under trouble conditions as specified.
 - 6. Visually inspect all wiring.
 - 7. Verify that the alarms are audible throughout all areas of the renovated area.
 - 8. Test 10 percent of initiating devices on other floors, as necessary, when required by NFPA 72.

3.6 SPARE PARTS AND TOOLS

- A. Interchangeable Parts: All spare parts furnished shall be directly interchangeable with the corresponding components of the installed system. Spare parts shall be suitably packaged and identified by nameplate, tagging, or stamping. Deliver spare parts to the construction engineer.

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- B. Spare Parts: Provide the following spare parts and accessories:
- 2 Fire alarm speakers of each type installed.
 - 2 Fire alarm strobes of each type installed.
 - 2 Combination fire alarm speaker/strobes of each type installed.
 - 2 Sets of special tools required for the maintenance of the system.
- C. Parts List: Furnish a list, in duplicate, of all other parts and accessories that the manufacturer of the system recommends to be stocked for maintenance.

END OF SECTION

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