Portland International Jetport (PWM)

Portland, Maine

Terminal Enhancement
Project Manual Issued For Permit
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Volume 1 of 3

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SPECIFICATIONS VOLUME 1

General Requirements Subgroup

Facility Construction Subgroup

SECTION 01 11 00 - SUMMARY OF WORK

PART 1 GENERAL

1.1 DEFINITIONS

A. Except in such events or instances where it would be a conflict or distort the true meaning of the Prime Contract Documents or the Subcontract Agreement, or any other Contract Documents the following shall apply when used in these General Requirements.

1. The term “Contractor” or “Subcontractor” shall also be construed to mean the “Subcontractor” or “Sub-subcontractor” performing the work or a vendor supplying materials.

2. The term “Architect” shall be construed to mean the Architect responsible for the project design.

3. The term “Engineer” shall be construed to mean the Engineer responsible for the project design.

4. The term “Construction Manager” or “CM” shall be construed to mean the Construction Manager who is responsible for the overall Project Construction Management.

5. The term “Owner” or "Jetport" shall be constructed to mean the City of Portland, Maine.

1.2 RELATED DOCUMENTS

A. All work specified herein shall comply with the requirements of the City of Portland, State of Maine, FAA, TSA, and the related Contract Documents.

1.3 SUMMARY

A. The Work of the Contract shall include but is not necessarily limited to the following: Partial interior demolition and interior renovation of existing commercial terminal including but not limited to: architectural, mechanical, electrical, plumbing, fire protection and telecommunication work. Construction of a new three story addition, plus mechanical mezzanine on the west end of the existing terminal to house ticketing, airline offices, concessions, passenger security screening, hold rooms, rest rooms and utility rooms. New construction also includes a new in-line baggage handling system and associated checked baggage screening and handling rooms. Sitework includes excavation, new roadways, underground utilities, sidewalks and vehicle parking.

1. Comply with all the requirements of Division 1 - General Requirements.

2. Performing all work and services shown on the Drawings and included in the Specifications Divisions 2 through 34 inclusive.

3. All work shall be performed in accordance with, but not necessarily limited to, the specified References and Standards, Codes, Rules and Regulations covering the Work of the Contract.

4. Perform all cutting, patching, repairing, painting and finishing required for the proper completion of all work shown on the Drawings, in the respective sections of the Specifications, and as required for the proper and expeditious completion of all Work under the Contract.

5. The Contractor shall coordinate the related work of all trades and specification sections.

6. Cooperate with all trades and/or Contractor performing Work under separate, but related Contracts.

1.4 WORK UNDER OTHER CONTRACTS

A. The Owner reserves the right to award other contracts, which may be concurrent with the work of this contract.

B. During the time that the Contractor is performing the Contract, other persons will be engaged in other operations on or about the construction site including the normal operations and maintenance of Portland International Jetport as well as operations of adjacent tenants.

C. The Contractor shall cooperate with and coordinate his operations with those of the Owner and all tenants

D. The Contractor shall so plan and conduct his operations as to work in harmony with others engaged at the construction site and not to delay, endanger or interfere with the operations of others, all to the best interests of the Owner and the public and as may be directed by the Engineer.

E. The Contractor shall cooperate with Contractors furnishing and installing Owner furnished items where shown on the Drawings and/or the Specifications.

1.5 WORK SEQUENCE

A. The Work shall be conducted in accordance with a Phasing Schedule submitted by the Contractor to the Construction Manager for review and approval, so as to provide the least possible interference to the activities of the existing Jetport operations.

B. Each Subcontractor, material supplier and fabricator connected with the project shall provide full and free access for Construction Manager, the Architect, Engineer, Owner, or their representatives.

C. The Contractor shall obtain and pay for use of additional storage or work areas needed for operations.

D. The Contractor shall pay all required fees for permits pertaining to the performance of the Work. Permit fees will not be waived by the City of Portland for this project.

1.6 CONTRACTOR USE OF PREMISES

A. General: Limit use of the premises to construction activities in areas indicated; allow for Engineer occupancy and use by his employees.

1. Confine operations to areas within Contract limits indicated, including storage of materials, supplies and equipment. Those portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. Keep driveways and entrances serving the premises clear and available to the Engineer and the Engineer's employees 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.

3. The Contractor shall perform all work in a manner that will cause the least interference to the operation of the existing site facilities, the tenants, and to the public.

4. Subject to the conditions elsewhere stated herein, areas to be occupied by the permanent construction will be made available to the Contractor upon the commencement of his first operations at the construction site.

5. 5. The Contractor will be permitted to use only so much of the aforesaid areas as is necessary for the performance of the Contract, and he must at all times so conduct his operations as not to encroach upon or block the portions used by others.

B. The Contractor is hereby advised of the following constraints:

1. Jetport Operations, FAA, Airlines and their employees will occupy portions of the site and existing Jetport Facilities during the entire construction period. Cooperate with the Jetport Operations, FAA, and Airlines during construction operations to minimize conflicts and facilitate Jetport Operation's, FAA, and Airline usage. Perform the Work so as not to interfere with the Jetport's operations. Refer to Section 01 15 10 Jetport Security Requirements for additional requirements.

1.7 EXAMINATION OF SITES

A. It is not the intent of the Drawings to show all existing conditions. All bidders are required to visit and examine the site and note any and all conditions which shall in no way relieve the Contractor from completing the work as required.

1.8 PLANS AND SPECIFICATIONS AT THE SITE

A. The Contractor shall maintain at the site of the work one (1) copy of all Drawings, Specifications, Addenda, approved Shop Drawings, Change Orders, and other modifications, schedules and instructions, in good order and marked to record all changes made during construction. These shall be available to the Engineer at all times.

1.9 DIMENSIONS AND MEASUREMENTS

A. The Contractor shall verify all dimensions for all built-in work and/or work adjoining that of other trades before ordering any material or doing any work, and shall be responsible for connection of same. Any difference which may be found shall be submitted to the Architect for consideration before proceeding with the work.

1.10 SURVEYS, LINES AND LEVELS

A. Be responsible for properly laying out the Work and for lines and measurements for the Work. Verify the figures shown on the Drawings before laying out the Work and report errors or inaccuracies to the Architect before commencing work.

B. Engage a currently Registered Land Surveyor to establish necessary reference lines and permanent bench marks, building lines and elevations and to lay out the Work. Establish not less than two such bench marks in widely separated locations. Be responsible for the proper location and level of the Work and for the maintenance of the referenced lines and benchmarks. Establish bench marks and axis lines at each floor showing exact floor elevations and other lines and dimensional reference points as required for the information and guidance of all trades; field checking of the structure and surveys thereof as may be required by the technical Sections of the Specifications; the marking and layout of walls and partitions; and the taking of settlement readings as specified in Section “Submittals”.

C. The Contract Documents are based upon the information furnished by the Owner. Such information is available from the Owner. The records are furnished for information only and are not guaranteed to represent all conditions that will be encountered nor are they guaranteed to be as shown. The records of existing construction represent all conditions known to the Owner. Other construction, of which no records are available, may be encountered. All dimensions of existing construction are based on data retrieved from existing contract documents created from the original base building and from information provided by the Owner. The Contractor shall field verify all existing conditions and/or dimensions.

C. The Contractor shall formulate his own conclusions as to the extent of such construction.

D. The Contractor shall take every precaution to guard against any movement or settlement of existing or new construction. Provide bracing, shoring, underpinning or other retaining structures necessary in connection there with and/or as required by Codes, Rules or Regulations governing same. Assume responsibility for the design, safety and support of such construction and for any movement, settlement, damage or injury thereto.

1.11 SUB-SURFACE SOIL REPORT

A. Any sub-surface soil data accompanying the Contract Documents is included for information only. Notify the CM immediately if such data is at variance with actual conditions encountered.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 01 15 10 - JETPORT SECURITY REQUIREMENTS

PART I - GENERAL:

1.01 RELATED WORK:

A. SUMMARY OF WORK: SECTION 01 11 00.

B. TEMPORARY FACILITIES AND CONTROLS.: SECTION 01 50 00

1.02 FAA SECURITY REQUIREMENTS:

A. Conform to the requirements of Federal Aviation Administration (FAA) security regulations, FAR1542, governing operation of airports with regularly scheduled air carrier operations. These documents can be accessed on the government website *http://www.gpoaccess.gov/ecfr/.*

B. Conform to requirements of the Appendix included in this SECTION 011510 entitled *Airport Security Regulations During Construction,* outlining portions of FAA regulations pertinent to the Portland International Jetport.

1.03 GENERAL SECURITY REQUIREMENTS:

A. Initiate and maintain a Security Plan for entire Project Site, subject to approval of Jetport security authorities.

B. Provide temporary security and protection measures, including, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fencing, sidewalk bridges, building enclosure/lockup, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at Project Site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

C. Provide and maintain adequate protective measures to separate new construction areas from existing buildings and environs utilized by Owner, until new construction is Substantially Complete and in use by Owner.

D. Consult with and coordinate with Jetport security staff. Prepare and distribute a summary of agreements reached to all concerned entities, including all subcontractors and major material vendors.

1. Conform to all fire prevention and other safety regulations of Owner. Comply with all directives of Jetport fire department, Jetport safety personnel, and security department.

E. Conform to following as minimum requirements:

1. Provide system for control of vehicles and persons entering and leaving the Contract Sites and Related areas, as approved by Owner's security staff.

    a. Provide approved system for identifying authorized vehicles.
    b. Provide approved system of identification for all employees and authorized individuals.
    c. Provide approved means of check-in and identification of authorized visitors.

2. Keep perimeters of Contract Sites secure at all times.

    a. Keep gates, doors and other access to Contract Sites and related areas secured at all times other than normal and working hours.

    b. Unless gates, doors and other access points are locked, post guards at access points when Contract Sites are vacated or substantially vacated during normal working hours, as during lunch breaks.

3. Provide and maintain temporary fencing, temporary partitions and other work as indicated and required.

    a. Refer to SECTION 01 50 00 for additional requirements.

4. At earliest possible date, secure building against authorized entrance at times when personnel are not working. Provide secure temporary enclosures at all locations of possible entry, with locked entrances.

    a. Coordinate with Jetport security staff.

5. Provide and maintain adequate protective measures to separate new construction areas from existing buildings and environs utilized by Owner, until new construction is Substantially Complete and in use by Owner.

1.04 PROTECTION OF EXISTING SERVICES:

A. Do not allow existing utilities or other services to be terminated other than for brief shutdown periods where necessary to connect new work. Before making any shutdowns, notify Owner at least two weeks in advance.

    1. Refer to SECTION 01 50 00 for additional requirements.

1.05 FIRE PROTECTION:

A. General: Initiate system of fire protection for protection of the Work of Contract as well as all existing facilities and operations.

1. Conform as a minimum to all requirements of Portland Fire Department, represented by its Fire Prevention Division.
2. Conform in particular to requirements covering access by emergency vehicles to and through the various Contract Sites.

B. Fire Department Telephone Numbers: Post local fire department call number on each telephone instrument and at each fire extinguisher at Project Site.

C. Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at Project Site, Provide Type A extinguishers at locations of low potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations. Post warning and quick-instructions at each extinguisher location, and instruct personnel at Project Site, at time of their first arrival, on proper use of extinguishers and other available facilities at Project Site.

1. Use of Permanent Portable Fire Extinguishers: Do not use permanent portable fire extinguishers for temporary construction use. Temporary units may be placed in permanent new cabinets or brackets, but fresh new extinguishers must be provided at or just before Substantial Completion.

D. Permanent New Fire Protection System: Complete each fire protection facility at earliest reasonable date, make ready for emergency use, and instruct personnel at site on availability and proper use.

1. Permanent Fire Protection System: Complete each fire protection facility at earliest reasonable date, make ready for emergency use, and instruct personnel at site on availability and proper use.

E. Existing Fire Alarm and Fire Protection Systems: Maintain existing fire alarm and fire protection systems at all times. If shutdowns are necessary, confine to periods when building is unoccupied and only after prior notification to local fire department and Owner's insurance services. If terminated accidentally, notify police and fire department immediately and take all measures necessary to resume protection as soon as possible.

1. **NOTE:** Where existing fire alarm fire protection systems must be shutdown, Contractor shall engage fire watch from Portland Fire Department and pay all costs in connection therewith. **Arrange for invoices to be sent directly to Contractor, not CM, Owner or Jetport.**

2. **NOTE:** If existing fire alarms or fire protection system accidentally terminated, notify Fire Department immediately and arrange for immediate fire watch until services are resumed, at full expense of Contractor.

Followed by Appendix 1 Airport Security Requirements During Construction and the Badge and Fingerprint forms

Appendix 1

AIRPORT SECURITY REGULATIONS DURING CONSTRUCTION

This document is offered as an aid to assist the Contractor in planning and executing construction. It is offered as a guideline and thus is not all-inclusive.

At some point every airport must perform some form of construction or maintenance. It is a necessity for airports to grow and develop; however, as necessary as construction may be, airports assume a great deal of risk and liability during construction events. Construction act ivies can be difficult and dangerous and airports must take appropriate precautions to limit their exposure and risk. The following outlines are intended as an overview that may change or be added to at anytime during construction so it is important that the Contractor develop a relationship and remain in constant communication with the Jetport's Security Manager at all times to monitor and act upon any changes which may be occurring.

PRE-CONSTRUCTION PLANNING

- The Contractor must develop a Security Plan. The plan is a mandatory item for all construction projects to maintain the safety of passengers, airline crews and Jetport personnel. The Security Plan is a mandatory item to ensure continuity of operations during construction. The Security Plan must be presented to the Jetport at the preconstruction meeting for review and must be in operations from the first day mobilization through the last day of demobilization. The Security Plan should consist of, but is not limited to the following:

    a) The Contractor must meet with all affected parties before the beginning of construction. Gather contact information for points of contacts and emergency contacts identified in the Security Plan.

    b) The Contractor must develop and coordinate a construction vehicle control plan – see section on Ground Vehicles.

    c) The Contractor must advise the Jetport how they will apply and comply with the Security Plan before they begin construction work.

    d) The Contractor must develop procedures for protecting safety areas, obstruction slopes, and other areas that must be protected.

    e) The Contractor must set specific limitations for construction activity that will effect operations or passenger safety.

f) The Contractor must make known to themselves all airport operational procedures that may affect them or their work.

g) The Contractor must advise the Jetport of all procedures that will be used during construction to adapt to and accommodate significant changes in airport operations or construction.

h) Construction has a significant potential to develop foreign object debris (FOD) – the Contractor must plan to limit the amount of FOD and keep the construction site clean at all times. Regular garbage disposal must be part of the plan.

i) The Contractor must use sweepers on the ramp to control FOD.

j) The Contractor must note that non-compliance to the Security Plan will result in severe penalties. The General Contractor can be fined up to $25,000 and employees up to $10,000 for not observing the security guidelines; therefore it is very important that the Contractor familiarizes himself with these procedures.

k) The Contractor is responsible for all education of control procedures for Sub-Contractors.

l) The Contractor must be aware that aircraft, ramp personnel and their support vehicles always have the right of way.

m) The Contractor must make sure that construction lighting is shielded to prevent blinding pilots or the ATCT. (Air traffic control tower)

n) The Contractor must inspect closed areas thoroughly before opening to airport operation use.

o) Before Construction begins, the Contractor must make sure to use as-built plans and other documents to prevent the accidental disruption of NAVAID, power, or communications cables/wires.

p) The Contractor must put in place measures to control dust during construction. Dust clouds can disrupt visibility, can obscure markings and signage, damage aircraft and can be an environmental hazard.

q) The Contractor shall be required to properly train and badge its designated employees in accordance with the City of Portland's Security Training Program. It is recommended that the ratio of non-badge employee to a badged employee should be no more than 4:1. See security guidelines for details.

SAFETY AREAS AND WORK LIMITS

During construction the Contractor must implement the specifics of the safety plan, including performing actions needed to protect critical areas such as runway safety areas, obstacle free zones for emergency vehicles and ramp equipment.

- The Contractor will not be allowed to stockpile materials in the emergency access ways.
- The Contractor should not park equipment in the emergency access ways.
- Temporary cranes must be NOTAM'd (notice to airmen) and marked with flags during the day and at night the boom must be stored in the horizontal (lowered) position.

GROUND VEHICLES

- The Security Plan must address ground vehicle control and operator training. All drivers that are projected to drive on the ramp (secure areas) must attend the driver's education class and pass an examination. The class is every Thursday at 9:00am and takes approximately 45 minutes. All vehicle operators on the ramp must be thoroughly trained in airport procedures, airport geometry, and communications. Heavy fines will apply if the Contractor does not comply with procedures.
- The Contractor must ensure that crane parking areas do not restrict Air Traffic Control's (ATC) line-of-sight, infringe on Navaid signals, or impact FAR Part 77 imaginary surfaces.
- The Contractor must limit vehicle access to airfield movement areas using security procedures at perimeter gates, utilizing guards and signs.
- The Contractor must limit vehicles in the secure areas to only those absolutely necessary.
- The Contractor is responsible to provide authorized escorts to construction/delivery vehicles as needed.
- The Airport Security Manager will issue a temporary pass for each vehicle temporary access to the aircraft operations area. Vehicles will be restricted to non-movement areas (ramps)unless under escort by an authorized vehicle in accordance with Federal Aviation Regulations.
- Temporary vehicle passes are colored and numbered sequentially. The Security Manager issues these passes in the airport manager's office. When requesting a vehicle pass the contractor should provide vehicle registration as well as a certificate of insurance with the City of Portland named

as additional insured. This pass should be placed on the dash of the vehicle. When the work is completed, the pass must be returned to the Security Manager.

SECURITY GUIDELINES

- There are specific security issues/requirements associated with construction and the Portland International Jetport. It is the Contractor's responsibility, as mentioned previously, to coordinate and communicate with the Jetport's Security Manager at all times during the construction period. The Security Manager must be briefed on all phases of the construction regarding breaches of the secure area to allow monitoring and communication with the TSA (Transportation Security Administration) group.

- The Contractor must ensure that temporary gates are monitored when in use, adequately secured when not in use, and equipped so they can be securely closed at the end of the day.

- The Contractor must familiarize employees with the importance of the term "piggybacking". "Piggybacking" is where authorized persons have passed through an entry point but only presented one badge. It is mandatory that all authorized persons use their badge when passing through into the secure area.

- Temporary fencing must not only keep out unwanted personnel and vehicles, it must also be designed to prevent access of animals. All penetrations to fencing must be repaired immediately to prevent entry of large animals onto the ramp.

- On an as needed basis, the Contractor will provide qualified security personnel in the construction zone for purposes necessary to complete the work if no authorized employee is available. The Contractor must employ either the Portland Police department or the security company currently contracted by the Jetport.

- If vehicles owned by the Contractor and/or Sub Contractors are to be used on the Air Carrier Apron, the vehicles will be equipped with roof mounted strobe amber colored lights for easy identification.

- The Contractor must ensure that no equipment be located, at any time, any closer than 6 feet from the outside of the construction fence to maintain security.

- The Contractor must assign one of their employees as Security Supervisor and make that person known to the Jetport Security Manager.

- The Security Plan must ensure that each authorized person continuously displays airport issued or approved identification while in restricted areas. Unescorted access allows properly identified individuals who have met with requirements of Federal Aviation Regulations to work in restricted areas without a representative of the airport present. For contractors this identification is BLUE in color and issued by the City of Portland. A properly authorized supervisor and/or foreman may act as an escort for a crew.

- Employees who will require unescorted access to restricted areas must have a PWM security ID prior to beginning work at the airport. All employees who are projected to have a PWM security ID must be fingerprinted. All employees who are projected to have a PWM security ID must fill out the Badge and Fingerprint forms which are available at the airport manager's office. Copies of these forms are attached to this appendix. Both forms must be filled out and signed by the employee and employer, and the employer must verify on the reverse side of the badge application. Two forms of identification must be brought to the fingerprinting office along with the badge and fingerprint forms. The fingerprinting will not take place if the ID's and forms are not presented. The cost of the application, per person, is $40. The fingerprinting process must be scheduled with the Security Manager and should take no longer than ½ hour. The contractor will notify the airport manager's office by phone or in person to schedule a class date. The results are normally returned within 72 hours. Only after the fingerprint approval has been received can the class then be scheduled. Security classes are held each Thursday morning at 10:00 am. Drivers education must be scheduled and begin at 9:00am each Thursday morning. The class and examination should be completed by 12:00 noon.

- The Contractor must monitor their personnel's compliance with airport rules and the construction Security Plan for the duration of the project.

- The City of Portland is accountable to the Transportation Security Administration (TSA) for all airport issued identification. Fines for lost, stolen or non-returned identification are as follows:

  Personal Identification: First reissue - $100
  Second reissue - $150
  Third reissue - $200
  Vehicle Identification - $100

- The City of Portland is authorized to produce, retrieve and control airport issued identification.

- Temporary Fencing: Should a phase of construction require that the existing perimeter fence be removed, temporary security fencing must be erected by the contractor. This security fence must provide the same degree of security as the existing fence. At no time should and unauthorized individual be able to gain access to the air operations area as the result of the lack of fencing. It may be necessary for the contractor to assign properly badge individuals whose main function is to prevent such an event from occurring during times when the fence is not in place. It will be the responsibility of the contractor (s) to ensure that unauthorized persons and vehicle do not gain access to the air operations area or any other restricted area.

- Perimeter Gates: All field gates are controlled by lock and key. Keys will be non-duplicable and may be issued to authorized, properly badged individuals in the airport manager's office. Should access authority by removed for an individual possessing a key, the key and identification will be returned to the airport manager's office within eight (8) hours after termination of access authority

  While gates are open and unsecured, there must be at least one properly badged individual positioned at the gate until the gate is again secured. This individual will be responsible for ensuring that no unauthorized persons are allowed access to the air operations area. This individual is also responsible for ensuring that persons and vehicles entering the air operations area are displaying proper identification.

  Persons having access authority under the Lock and Key Control Plan will be required to acknowledge by signature the polices of this plan and understand that lost keys will result in a $250 fine in addition to the cost of servicing the lock. Keys will be provided to only those persons whose office duties require access to the area beyond that point of access. Locks must be changed immediately when a key becomes lost, stolen, not returned or when access authority changes.

- The Contractor must not leave any vehicle, tools, equipment, or materials unattended at any time outside of construction zone fence. Failure to observe this will result in heavy fines and confiscation of the article left unattended.

END OF SECTION 01 15 10

File # _____

Fingerprint Application Form

49 CFR Part 1542.209 (28 Disqualifying Crimes)

[1]Forgery of certificates; false marking of aircraft, and other aircraft registration violations [2]Interference with air navigation [3]Improper transportation of hazardous material [4]Aircraft piracy [5]Interference with flight crew members or flight attendants [6]Commission of certain crimes aboard aircraft in flight [7]Carrying a weapon or explosive aboard an aircraft [8]Conveying false information and threats [9]Aircraft piracy outside the special aircraft jurisdiction of the United States [10]Lighting violations involving transporting controlled substances [11]Unlawful entry into an aircraft or airport area that serves air carriers or foreign air carriers contrary to established security requirements [12]Destruction of an aircraft or aircraft facility [13]Murder [14]Assault with intent to murder [15]Espionage [16]Sedition [17]Kidnapping or hostage taking [18]Treason [19]Rape or Aggravated sexual abuse [20]Unlawful possession, use, sale, distribution, or manufacture of an explosive or weapon [21]Extortion [22]Armed or felony unarmed robbery [23]Distribution of, or intent to distribute, a controlled substance [24]Felony arson [25]Felony involving a threat [26]Felony involving-(i) Willful destruction of property; (ii) Importation or manufacture of a controlled substance; (iii) Burglary; (iv) Theft; (v) Dishonesty, fraud, or misrepresentation; (vi) Possession or distribution of stolen property; (vii) Aggravated assault; (viii) Bribery; or (ix) Illegal possession of a controlled substance punishable by a maximum term or imprisonment of more than 1 year [27]Violence at international airport [28]Conspiracy or attempt to commit any of the criminal acts listed in this paragraph.

I certify that I have not been convicted of any of the crimes listed above. I understand that 49 CFR Part 1542.209 (1) imposes a continuing obligation to disclose to an Airport Security Coordinator within 24 hours if I am convicted of any of the 28 disqualifying crimes listed above if I have unescorted access privileges. The information I have provided on this application is true, complete and correct to the best of my knowledge and belief and is provided in good faith. I understand that knowing and willful false statement on this application can be punished by fine or imprisonment or both (See Section 1001 of Title 18 United States Code) I understand that my fingerprints will be submitted to the FBI for review, and the results (including arrest record and convictions) will be provided to the Portland International Jetport, Security Division.

Please check one of the items listed below:

- ❑ I have not been convicted of any of the above listed crimes.
- ❑ I have been convicted of one of the above listed crimes *(Please list below)*

Date *Description*

The Airport operator holds the right to approve or deny a badge based upon the results of the fingerprint information.

_____ _____

Printed Name of Applicant *Date*

_____

Signature of Applicant

Date: _____ File #_____

PORTLAND INTERNATIONAL JETPORT

To Be Completed By Applicant

All information on this form must be printed and legible. ***Any form that cannot be read will not be processed.***

Name: _____
Last **First** **Full Middle**

List any additional names you have used (Alias, Maiden, or Nicknames)

Social Security Number: _____ **Date of Birth (YYYY/MM/DD):** _____

Employer: _____

Employer Address: _____
Street/Physical Address City State Zip

Home Address: _____
Street/Physical Address City State Zip

State of Birth (If born in the US): _____ **Country of Birth** (If born outside of US):_____

Gender: Male Female Other **Race:** _____

Eyes: _____ (color) **Hair:** _____ (color) **Height:** _____ (ft) _____ (in) **Weight:** _____ (lbs)
Are you a U. S. Citizen: Y N If **NOT**, then please answer the following questions:

What country are you a citizen of?

Are you authorized to work by the US Government? Y N
Are you operating with a CDL by Canada or Mexico and admitted to the US under
8 CFR 214.2(b)(4)(i)(E)? Y N
Alien Registration Number (if applicable):
Non-Immigrant Visa Number (if applicable):
Passport Country (if applicable):
Passport Number (if applicable):

List all other employers you hold a PWM Secured Area or SIDA badge for:

E-mail address: _____ **Phone # (H)** _____ **(W)** _____
Are you an employee of a Federal, State or local government? Y N

If yes, then please sign here:

_____
Signature Date

COPIES OF ALL IDENTIFICATION MUST BE ATTACHED TO THIS FORM BEFORE FINGERPRINTING CAN TAKE PLACE.

Please thoroughly read all of the information provided on this page. If you have any questions, make sure they are answered before you sign your name and date at the bottom of this page.

All badged employees must follow all Federal, State, and Local regulation requirements.

49 CFR Part 1540 now holds each individual responsible for their actions as they may pertain to airport security. Following is a summary those responsibilities:

No one may tamper, interfere with, compromise, modify, attempt to modify, attempt to circumvent, or cause a person to tamper or interfere with, compromise, modify, or attempt to circumvent any security system, measure, or procedure implemented.

Enter, or be present within, a secured area, SIDA or sterile area without complying with the systems, measures, or procedures being applied to control access to, or presence or movement in such areas.

Use, allow to be used, or cause to be used, any airport-issued or airport approved access medium or identification medium that authorizes the access, presence, or movement of persons or vehicles in secured areas, or SIDAs in any other manner than that for which it was issued by the appropriate authority under this part… (1540.105)

No person may make, or cause to be made, any fraudulent or intentionally false statement in any application for any security program, access medium, or identification medium…any reproduction or alteration…of any…access medium, or identification medium issued under this part. (1540.103)

My security identification badge remains the property of the Portland International Jetport (PWM), is issued for my use as long as I have an operational need for unescorted access, and is not transferable to any other individual. PWM has the right to revoke the authorization of individuals with security identification badges where such action is determined to be in the best interest of airport security.

My security identification badge must be displayed on my outermost garment above the waist at all times while inside the, SIDA, or Secured Area. (1542.211)

I must challenge individuals who are not displaying airport issued or airport approved, identification and immediately notify Communications Center (207-756-8310) of any individual with an invalid ID, or who cannot produce a valid airport issued or airport approved ID. (1542.211(d))

Each individual is accountable to the airport and the TSA under the Airport Security Program (ASP). Individuals will be held accountable for any misinformation provided (such as on the badge and/or fingerprint application) and for any violation of the federal regulations, the TSA approved Airport Security Program (ASP) or Security Directives (SDs). Any offense may be punishable by airport sanctions and/or a fine from TSA.

All persons in the SIDA are prohibited from possessing a firearm unless the firearm is being transported for use at a different location, or is in the possession of an on-duty law enforcement officer on official business. (1540.111)

The information I have provided is true, complete, and correct to the best of my knowledge and belief and is provided in good faith. I understand that a knowing and willful false statement can be punished by fine or imprisonment or both. (See Section 1001 of Title 18 of the United States Code). I have read and understand the individual responsibilities outlined above, and will comply with all PWM and TSA policies and regulations.

_____ _____

Name Printed Signature Date

Privacy Act Notice

Authority: 49 U.S.C. §114 authorizes the collection of this information.

Purpose: DHS will use this information to conduct a security threat assessment on airport employees and other personnel or applicants who work in or have unescorted access to the, secured area, sterile area, SIDA, or any area for which the airport has issued a personnel identification media.

Routine Uses: The information will be used by and disclosed to DHS personnel and contractors or other agents who need the information to assist in activities related to aviation security. Additionally, DHS may share the information with facility operators, law enforcement or other government agencies as necessary to respond to potential or actual threats to transportation security, or pursuant to its published Privacy Act system of records notice.

Disclosure: Furnishing this information is voluntary. However, failure to furnish the requested information may delay or prevent the completion of your security threat assessment, which may prevent your access to the **SIDA**, secured area, sterile area, or other area or purpose for which personnel identification media are issued.

_____ _____

Applicant Name Printed Applicant Signature Date

TO BE COMPLETED BY EMPLOYER/SPONSORING AGENCY

Applicant's Job Title: _____

Type of access requested (circle all applicable): Secured Area SIDA Sterile Area

Will this applicant is authorized to shunt/override the alarm on access control doors (including bag belts).

Keys/Codes/Prox Card for the following gate(s):

I have reviewed this application, including the vehicle registration page (if applicable) and certify that the requested credentials are necessary for the proper performance of the applicant's duties. This applicant will be given training by this company to conduct his/her job in a manner that will have no negative affect on the safety and security of persons or property traveling in air transportation. Upon the termination of this employee, an Airport Security Coordinator or Communications Center will be notified so the badge can be deactivated, and their airport issued identification badge will be immediately returned to the Communications Center. I understand that failure to turn in this individual's badge and key will result in a $150 charge to the company that individual was employed with. _____ ***(Initial)*** This further certifies that no "person", as defined by 14 CFR Part 1.1 has made fraudulent or intentionally false statements on this application consistent with 49 CFR Part 1540.103. I understand that this company will be responsible for the following fees (if applicable):

Fingerprinting Fee: **$40** (If applicable)

1st Lost Badge Fee: $100 (if badge is not returned within 30 days)

Temporary (30 day) badges will be issued on a case by case basis, provided we receive a letter from the Manager/Supervisor explaining why this individual needs to have a temporary badge issued. The individual must pay the $100 lost badge fee up front, however if the original badge is found within the 30 days, the individual will receive a refund of $75.

2nd Lost Badge Fee: $150 (if badge is not returned within 30 days)

3rd Lost Badge Fee: $200 (if badge is not returned within 30 days)

Lost Intellikey Fee: $50

Payment is due when the badge is issued, unless prior arrangements have been made with PWM.

_____

Printed name of person authorizing applicant

_____

Signature of person authorizing applicant

_____

Company Name

Address: _____

_____

_____ _____

Date Contact Phone #

OFFICE USE ONLY

This individual has received training as required by 49 CFR Part 1542.213 and as outlined in the PWM, TSA approved Airport Security Program.

Training Date: _____

Picture #: _____Date Activated: _____ Date Deactivated: _____

Access Required: _____ Pin: _____

Prox Card # _____/_____/_____/_____/_____/_____/_____/_____/_____

Orig. Issue 1st renewal 2nd renewal 3rd renewal 4th renewal 5th renewal 6th renewal 7th renewal 8th renewal

Payment: Cash or Check or Bill **Amount:** _____ **Finance Dept**: _____

Reissue: Reason: _____ Date: _____

Prox Card # _____/_____/_____/_____/_____/_____/_____/_____/_____

Orig. Issue 1st renewal 2nd renewal 3rd renewal 4th renewal 5th renewal 6th renewal 7th renewal 8th renewal

List of Acceptable Documents

LIST A **OR** **LIST B** **AND** **LIST C**

Documents that Establish Both Identity and Employment Eligibility

1. U.S. Passport (unexpired or expired)
2. Certificate of U.S. Citizenship (USCIS Form N-560 or N-561)
3. Certificate of Naturalization (USCIS Form N-550 or N-570)
4. Unexpired foreign passport, with I-551 stamp or attached Form l-94 indicating unexpired employment authorization
5. Permanent Resident Card or Alien Registration Receipt Card with photograph (USCIS Form l-151 or l-551)
6. Unexpired Temporary Resident Card (USCIS Form l-688)
7. Unexpired Employment Authorization Card (USCIS Form l-688A)
8. Unexpired Reentry Permit (USCIS Form l-327)
9. Unexpired Refugee Travel Document (USCIS Form l-571)
10. Unexpired Employment Authorization Document issued by USCIS that contains a photograph (USCIS Form l-688B)

Documents that Establish Identity

1. Driver's license or ID card issued by a State or outlying possession of the United States provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address
2. ID card issued by Federal, State, or local government agency or entity provided it contains a photograph or information such as name, date of birth, gender, height, eye color, and address
3. School ID card with a photograph
4. Voter's registration card
5. U.S. Military card or draft record
6. Military dependent's ID card
7. U.S. Coast Guard Merchant Mariner Card
8. Native American tribal document
9. Driver's license issued by a Canadian government authority

For persons under the age of 18 who are unable to present a document listed above

1. School record or report card
2. Clinic, doctor, or hospital record
3. Day-care or nursery school record

Documents that Establish Employment Eligibility

1. Social Security card issued by the Social Security Administration (other than a card stating it is not valid for employment)
2. Certification of Birth Abroad Issued by the Department of State (Form FS-545 or Form DS-1350)
3. Original or certified copy of a birth certificate issued by a State, county, municipal authority, or outlying possession of the United States bearing an official seal
4. Native American tribal document
5. U.S. Citizen ID Card (USCIS Form l-197)
6. ID Card for use of Resident Citizen in the United States (USCIS Form l-179)
7. Unexpired employment authorization document issued by USCIS (other than those listed under List A)

Security Badge Application
Authorized Signature Form

Company/Organization:_____

Name of Authorized Individual: _____

Position/Title of Authorized Individual: _____

Contact Phone Number: _____

Contact Email Address: _____

Contact/Billing Mailing Address: _____

Authorized Signature: _____

Authorized Initials: _____

- -

Name of Authorized Individual: _____

Position/Title of Authorized Individual: _____

Contact Phone Number: _____

Contact Email Address: _____

Contact/Billing Mailing Address: _____

Authorized Signature: _____

Authorized Initials: _____

Should you have extenuating circumstances and require more than 2 authorizations, please submit additional forms as necessary.

SECTION 01 21 00 - ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when direction will be provided to Contractor. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Unit-cost allowances.
3. Quantity allowances.

C. Related Requirements:

1. Division 01 Section "Unit Prices" for procedures for using unit prices.
2. Division 01 Section "Quality Requirements" for procedures governing the use of allowances for testing and inspecting.
3. Divisions 02 through 33 Sections for items of Work covered by allowances.

1.3 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Architect from the designated supplier.

1.4 ACTION SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

1.5 INFORMATIONAL SUBMITTALS

A. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

B. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.6 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.7 LUMP-SUM UNIT-COST AND QUANTITY ALLOWANCES

A. Allowance shall include cost to Contractor of specific products and materials ordered by Owner or selected by Architect under allowance and shall include taxes, freight, and delivery to Project site.

B. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner or selected by Architect under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.

1. Include installation costs in purchase amount only where indicated as part of the allowance.
2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the purchase order amount or Contractor's handling, labor, installation, overhead, and profit.

1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Quantity Allowance: Include 900 cubic yards (CY) of rock removal and replacement with satisfactory soil material, as specified in Division 31 Section "Earth Moving."

1. Coordinate quantity allowance adjustment with unit-price requirements in Division 01 Section "Unit Prices."

B. Allowance No. 2: Lump-Sum Allowance: Include the sum of one million, one hundred and forty thousand dollars ($1,140,000.00). This allowance covers a fully operative integrated airport system, referred to herein as the Airport Information Management System (AIMS) that meets all of the equipment, functional, operational, performance, and redundancy requirements in the Project Plans (Section Titled MF) and Specifications (Section 27 42 16). Electrical Power and Data Connectivity, inclusive of all conduit and cabling, shall be by others as referenced in the Electrical and Telecommunications sections of the drawings and specifications.

1. This allowance includes material cost receiving, handling, and installation and Contractor overhead and profit.

END OF SECTION 01 21 00

SECTION 01 22 00 - UNIT PRICES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

1.2 DEFINITIONS

A. Unit price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, by an independent surveyor acceptable to Contractor. Should the results of the survey determine that the Contractor’s measurements were accurate, the Owner shall be responsible for all costs associated with the survey, including but not limited to, exposure, testing and/or inspection, replacement, and reconstruction or restoration. Should the results determine that the Contractor’s measurements were inaccurate, said costs shall be paid for by the Contractor.

D. List of Unit Prices: A list of unit prices is included at the end of this Section. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

1. 31 23 16 Rock Removal for Utilities. Provide unit price per cubic yard (CY) of rock removal on the bid form. Provide rock removal allowance of 700 CY under base bid.
2. 31 23 16 Rock Removal for Building / Foundations. Provide unit price per cubic yard (CY) of rock removal on the bid form. Provide rock removal allowance of 200 CY under base bid.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used

END OF SECTION

SECTION 01 23 00- ALTERNATES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements governing Alternates.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 DEFINITIONS

A. Definition: An alternate is an amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate the Alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Modify or adjust affected adjacent Work as necessary to completely and fully integrate that Work into the Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

B. Notification: Immediately following the award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate whether alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other Work of this Contract.

D. Schedule: A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials necessary to achieve the Work described under each alternate.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. ADD ALTERNATE NO. 1: Extend exterior landside canopy and additional two structural bays with structure, roofing, underground roof drainage, finishes, and lighting identical to that between column line Y10.5 and Y8.5 (approx 64 lineal feet). See drawings A02.02.07, A02.03.07, A02.RP.07, A09.04 elevations 5&6, A09.70 and A12.40 for details.

B. DEDUCT ALTERNATE NO. 2: Provide exterior metal panel and interior finish per drawing A09.20/Wall Type A between column lines XC and XD on Column Line ZA (and) between column lines Z1 and Z2 on Column Line XC in lieu of glazed aluminum curtainwall shown for base bid. See drawings A02.05.06, A02.04.06/ detail 1 and A9.02/detail 1.

C. ADD ALTERNATE NO. 3: Provide fire protection and acoustical tile ceiling modifications in selected areas of the existing terminal as shown on Fire Protection drawings.

D. DEDUCT ALTERNATE NO. 4: On all elevated slabs and slabs-on-grade scheduled for polished finish: Provide small aggregate high sheen polished floor 1/8” grind depth (deduct alternate) in lieu of large aggregate high sheen polished floor 1/4” grind depth (base bid).

E. DEDUCT ALTERNATE NO. 5: At column line XG.6 on Level 3, provide partition type C3B in lieu of interior glazed aluminum curtain wall IG-03 shown for base bid. See drawings A02.03.04, A02.03.05, and A11.01/detail 1& 2

END OF SECTION 01 23 00

SECTION 01 25 13 - PRODUCT SUBSTITUTION PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for handling requests for substitutions made after award of Contract.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 RELATED SECTIONS

A. Other Division 1 Specification Sections including, but not limited to, following:

1. Section 01 78 39 Project Record Documents: Submittal or record documents.

1.4 DEFINITIONS

A. Available Products: Products, materials, equipment, and methods of construction that may be incorporated in Work are indicated and specified in Contract Documents. Use of catalog numbers, and specific requirements set forth in Drawings and Specifications, are not intended to preclude use of other acceptable manufacturer's products or procedures which may be equivalent, but are given for purpose of establishing standard of quality for materials, construction, and workmanship. Equivalent products of manufacturers named as acceptable manufacturers may be submitted for approval. Equivalent products of manufacturers not named as acceptable manufacturers are subject to submittal requirements for substitutions specified in this Section.

B. Equivalent Products: Products, materials, equipment, and methods of construction which are, in Engineer/Architect’s sole judgment, equal in quality and maintainability, and functionally and aesthetically equal to product specified as basis for design.

C. Changes in products, materials, equipment, and methods of construction required by Contract Documents proposed by Contractor after award of Contract are considered to be requests for substitutions. Following are not considered to be requests for substitutions:

1. Substitutions requested during bidding period, and accepted by Bid Modification prior to award of Contract, are included in Contract Documents and are not subject to requirements specified in this Section for Substitutions.

2. Revisions to Contract Documents requested by Owner, Construction Manager, or Engineer/Architect.

3. Specified options of products and construction methods included in Contract Documents.

4. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.5 SUBMITTALS

A. Substitutions will not be considered when:

1. Indicated on shop drawings or product data submittals without separate formal request.

2. Requested directly by subcontractor or supplier.

3. Acceptance will require substantial revision of Contract Documents.

4. Proposed changes are not in keeping with general intent of Contract Documents.

B. Requests for substitutions will be considered only at least 10 days prior to the date for receipt of bids. Other requests will be considered only when:

1. Specified product or method of construction cannot be provided within Contract Time. Engineer/Architect or Construction Manager will not consider request if product or method cannot be provided as result of failure to pursue Work promptly or coordinate activities properly.

2. Subsequent information or changes indicate specified product will not perform as intended.

3. Requested substitution offers Owner substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities include, but are not limited to, compensation to Engineer/Architect for redesign and evaluation services, compensation to Construction Manager for additional processing and evaluation services, and increased cost of other construction by Owner.

   a. Based upon approval of Owner, Construction Manager’s and Engineer/ Architect’s time shall be compensated as specified for compensation of Engineer/ Architect’s time in subsequent article titled Modification of Documents.

4. Specified product or method of construction cannot receive necessary approval by governing authority, and requested substitution can be approved.

5. Specified product or method of construction cannot be provided in manner that is compatible with other materials and where Contractor certifies that substitution will overcome incompatibility.

6. Specified product or method of construction cannot be coordinated with other materials and where Contractor certifies that proposed substitution can be coordinated.

7. Specified product or method of construction cannot provide warranty required by Contract Documents and where Contractor certifies that proposed substitution provides required warranty.

C. Do not order or install substitute products without written acceptance.

D. Engineer/Architect will determine acceptability of substitutions.

E. Submit 2 copies of each request to Engineer/Architect through Construction Manager on Substitution Request Form at end of Section. Submit separate form for each substitution.

F. By making requests for substitutions, Contractor:

1. Represents that Contractor has personally investigated proposed substitute product and determined that it is equal to or superior in all respects to that specified.

2. Represents that Contractor will provide same warranty for substitution that Contractor would for that specified.

3. Will coordinate installation of accepted substitute, making such changes as may be required for Work to be compatible with substrates and adjacent materials, and complete in all respects.

4. Waives claims for additional time related to substitution, which may later become apparent.

5. Certifies that cost data presented is complete and includes related costs under this Contract, including redesign costs, and waives claims for additional costs related to substitution which may later become apparent if required.

G. Modification of Documents: Where substitution requires changes to design of Work, furnish drawings and specifications prepared by and bearing seal of licensed architect and engineers as appropriate, revising Contract Documents.

1. Revised Drawings: Sufficiently complete for proper installation of substitution and related Work.

a. Include details of connection to and relationship with adjacent materials.

2. Revised drawings: Submit with Record Documents in accordance with Section 01 78 39

1.6 SUBMITTAL PROCEDURES

A. Engineer/Architect's and Construction Manager’s Action: If necessary, Engineer/Architect through Construction Manager will request additional information or documentation for evaluation within 1 week of receipt of request for substitution. Engineer/Architect will notify Contractor of acceptance or rejection of substitution within 2 weeks of receipt of request, or 1 week of receipt of additional information or documentation, whichever is later. Acceptance will be in form of Change Order.

1. Use product specified if Engineer/Architect and Construction Manager cannot make decision on use of proposed substitute within time allocated.

2. If accepted by Engineer/Architect and Construction Manager products proposed for substitution are accepted subject to modifications by manufacturer, if necessary, to meet detailed requirements of Drawings, and Specifications.

B. For Accepted Products: Submit shop drawings, product data, and samples in accordance with Section 01 33 00.

C. Contractor's submittal, and Engineer/Architect's and Construction Manager's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with Contract Documents do not constitute acceptable or valid request for substitution, nor do they constitute approval.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

END OF SECTION

SUBSTITUTION REQUEST FORM FOLLOWS

SUBSTITUTION REQUEST FORM

TO: ARCHITECT / ENGINEER VIA Construction Manager

***** *COMPLETE [BRACKETED TEXT] IN ITEM BELOW.*
PROJECT NAME: [_____] PROJECT NO:[_____]

Only 1 request for substitution for each product will be considered. When substitution is not accepted, provide specified product.

We hereby submit for your consideration the following product instead of the specified item for the above Project

Specification Section _____ Article Number_____

Specified Item _____

Proposed Substitution:_____ Manufacturer's Name: _____

Address: _____

Trade name of product:: _____ Model or Catalog Number: _____

Reason for Substitution: _____

_____

List fabricators and suppliers: _____

List itemized comparison of proposed substitution with specified product, listing variation, quality, and reference to Article numbers.

Article Number	Specified Item	Proposed Item
1.		
2.		
3.		
4.		
5.		
6.		
7.		

Attach additional sheet as required.

Attach written certification from manufacturer that proposed substitution is appropriate for this application.

List availability of maintenance services and replacement materials:_____

Does the substitution affect dimensions shown on Drawings? Yes____No____. If yes, clearly indicate changes.

Will the undersigned pay for changes to the building design, including architectural, engineering and detailing costs caused by the requested substitution? Yes_____ No_____.

What effect does substitution have on other trades? _____

What effect does substitution have on construction schedule? _____

Differences between proposed substitution and specified item? _____

Manufacturer's guarantees of the proposed and specified items are: _____ Same_____ Different (explain on attachment)

Attach complete product data, including but not limited to laboratory tests, approval numbers, research report numbers, listings, and approved assembly descriptions as requested by Construction Manager or Engineer/Architect, or as required by agencies having jurisdiction.

Include complete information on changes to Drawings and Specifications which proposed substitution will require for proper installation.

Construction Manager

CONTRACTOR

By_____

Date _____

By _____

Date _____

Remarks _____

_____

Architect / Engineer

By _____

Date _____

Remarks _____

_____

SECTION 01 29 00 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 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.

1.3 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 Architect and Owner through Construction Manager for approval within 14 calendar days of award of contract.

3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.

4. Payment requisitions shall use AIA documents.

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 Engineer/Architect.
   c. Engineer/Architect 's project number.
   d. Contractor's name and address.
   e. Date of submittal.

f. Owner's Project Name and Number.
g. Contractor's sequential "Draw" Number.

2. 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.

3. 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. Provide separate, sequentially numbered line items separating labor (and/or installation) and material items.

a. Break down principal subcontract amounts into separate labor (and/ or installation) and materials items. Breakdown of subcontractor's schedule of values must be true and accurate.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.

5. 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. Include evidence of insurance or bonded warehousing if required.

6. 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.
7. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
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.

1.4 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer/Architect and Construction Manager 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.

B. Payment Application Review:

1. Prior to the 25th day of each month, furnish the CM with a draft (pencil) copy of the Application for Payment.
2. On the 25th day of each month, the Owner, the CM and the Contractor shall meet to review the draft (pencil) copy of the application and Certificate for payment. Questions resulting from this review shall be answered by the Contractor and clarified prior to receipt of the final copy of the Application and Certificate for Payment which is to be submitted to the Engineer/Architect on the 1st day of the following month.
3. Upon receipt of the final Application and Certificate for Payment and other documentation as required by the CM, including the updated Schedule of Values and the updated Construction Schedule, the CM shall review the documents received to determine if they correspond to the agreements reached during the draft (pencil) copy review. Upon completion of the CM's review, the CM shall revise and execute the Applications and Certificate for Payment to correspond to the agreements reached and forward the executed copies to the Owner.
4. In taking action on the contractor's Application and Certificate for Payment, the CM will rely on the accuracy and completeness of the information furnished by the contractor and will not be deemed to represent that he has made audits of the supporting data.
5. Payment will not be made for materials and equipment stored off the site, except at the Owner's discretion and prior approval. Owner will be more likely to approve requests for higher value stored items (e.g. mechanical equipment). Payment requests for lower value multiple stored items (e.g. electrical wiring, signage, etc) is discouraged. When the Application and Certificate for Payment includes material or equipment stored off-site, the Application shall be accompanied by a statement certifying:

a. Description of the item(s) being stored.
b. Location of the bonded warehouse(s) where materials or equipment is being stored.
c. Affidavit of Storage.
d. Certificate of Insurance.

e. Bill of sale made to Owner stating there will be no additional cost for transportation and delivery of the item(s) being stored.
f. Statement certifying that item or any part thereof will not be installed in any construction other than work under this Contract.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703n 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. Construction Manager 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 Construction Manager 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 notarized 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, before 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 Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.

a. Submit final Application for Payment with or proceeded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.

5. 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. Schedule of Values.
2. Contractor's Construction Schedule (preliminary if not final).
3. Products list.
4. Schedule of unit prices.
5. Submittals Schedule (preliminary if not final).
6. List of Contractor's staff assignments.
7. List of Contractor's principal consultants.
8. Initial progress report.
9. Certificates of insurance and insurance policies.
10. Data needed to acquire Owner’s insurance coverage(s).
11. Performance and payment bonds.
12. Data needed to acquire Owner's insurance.

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.
3. Withheld retainage at Substantial Completion will be per contract percentages defined by the Owner and documented in the final Construction Contract. Retainage to Construction Manager, Contractors, subcontractors, vendors or suppliers shall not be released prior to Substantial Completion.

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, including, but not limited to:

   a. Transmittal of required Project Record Documents to Owner.
   b. Evidence of completion of demonstration and training.
   c. Verify Receipt of record drawings.

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" and AIA Document G706A, "Contractor's Affidavit of Release of Liens."
5. AIA Document G707, "Consent of Surety to Final Payment."
6. Evidence that claims have been settled.

7. 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.
8. Final, liquidated damages settlement statement.
9. Occupancy permits, as applicable and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of completed work.
10. Completion of Final Punch list.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. Coordination drawings.
   2. Requests for Information (RFIs).
   3. Project Web site.
   4. Project meetings.

B. Related Sections:
   1. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

A. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information from each other during construction.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
   1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
   2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
   3. Make adequate provisions to accommodate items scheduled for later installation.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
   1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
   1. Preparation of Contractor's construction schedule.

2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

1.4 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings in accordance with requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
   1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
      a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
      b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
   1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire protection, fire alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
   2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
   3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire protection, fire alarm, and electrical equipment.
   4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
   5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
   6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are the Contractor's responsibility.

1.5 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
   1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
   2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
   1. Project name.
   2. Project number.
   3. Date.
   4. Name of Contractor.
   5. Name of Architect and Construction Manager.
   6. RFI number, numbered sequentially.
   7. RFI subject.
   8. Specification Section number and title and related paragraphs, as appropriate.
   9. Drawing number and detail references, as appropriate.
   10. Field dimensions and conditions, as appropriate.
   11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
   12. Contractor's signature.
   13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

D. Architect's and Construction Manager's Action: Architect and Construction Manager will review each RFI, determine action required, and respond. Allow seven Insert number working days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or inaccurately prepared RFIs.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's and Construction Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Construction Manager within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use software log that is part of Project Web site. Software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect and Construction Manager.
4. RFI number including RFIs that were dropped and not submitted.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's and Construction Manager's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
9. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

1.6 PROJECT WEB SITE

A. Use Construction Manager's Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:
1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.
12. Online document collaboration.
13. Reminder and tracking functions.
14. Archiving functions.

B. Contractor, subcontractors, and other parties granted access by the Contractor to Project Web site shall execute a data licensing agreement in the form of an Agreement acceptable to the Owner and Architect.

1.7 PROJECT MEETINGS

A. General: Construction Manager will schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Construction Manager, and Architect, within three days of the meeting.

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Procedures for processing field decisions and Change Orders.
    f. Procedures for RFIs.
    g. Procedures for testing and inspecting.
    h. Procedures for processing Applications for Payment.
    i. Distribution of the Contract Documents.
    j. Submittal procedures.
    k. Sustainable design requirements.
    l. Preparation of record documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and

installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   a. Contract Documents.
   b. Options.
   c. Related RFIs.
   d. Related Change Orders.
   e. Purchases.
   f. Deliveries.
   g. Submittals.
   h. Review of mockups.
   i. Possible conflicts.
   j. Compatibility problems.
   k. Time schedules.
   l. Weather limitations.
   m. Manufacturer's written recommendations.
   n. Warranty requirements.
   o. Compatibility of materials.
   p. Acceptability of substrates.
   q. Temporary facilities and controls.
   r. Space and access limitations.
   s. Regulations of authorities having jurisdiction.
   t. Testing and inspecting requirements.
   u. Installation procedures.
   v. Coordination with other work.
   w. Required performance results.
   x. Protection of adjacent work.
   y. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Progress Meetings: Construction Manager will conduct progress meetings at weekly intervals.
1. Attendees: In addition to representatives of Owner , Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to

do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Temporary facilities and controls.
9) Progress cleaning.
10) Quality and work standards.
11) Status of correction of deficient items.
12) Field observations.
13) Status of RFIs.
14) Status of proposal requests.
15) Pending changes.
16) Status of Change Orders.
17) Pending claims and disputes.
18) Documentation of information for payment requests.

3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 31 00

SECTION 01 32 33 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

1. Preconstruction photographs.
2. Periodic construction photographs.

B. Related Sections:

1. Division 01 Section "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.

1.2 SUBMITTALS

A. Key Plan: Submit key plan of Project site and building with notation of vantage points marked for location and direction of each photograph. Indicate elevation or story of construction. Include same information as corresponding photographic documentation.

B. Digital Construction Photographs:

1. Digital Camera: Minimum sensor resolution of 8 megapixels.

2. Format: 8-by-10-inch (203-by-254-mm) color laser print, single sided, two photographs per page, punched for standard three-ring binder.
3. Identification: On each page, provide the following information:

a. Name of Project.
b. Name of Architect and Construction Manager.
c. Date photograph was taken if not date stamped by camera.
d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
e. Unique sequential identifier keyed to accompanying key plan.

1.3 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

A. Digital Images: Provide images in JPG format, with minimum size of 8 megapixels.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

B. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software. Submit electronic files of digital images at Substantial Completion, organized chronologically. Provide electronic copies of selected photographs periodically during construction, as requested by the Architect.

1. Date and Time: Include date and time in file name for each image.
2. Field Office Images: Maintain one set of images accessible in the field office at Project site, available at all times for reference. Identify images in the same manner as those submitted to Architect and Construction Manager.

C. Preconstruction Photographs: Before commencement of excavation, take photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect.

1. Flag excavation areas and construction limits before taking construction photographs.
2. Take minimum 50 photographs to show existing conditions adjacent to property before starting the Work.
3. Take minimum 50 photographs of existing buildings/interiors either on or adjoining property to accurately record physical conditions at start of construction.

D. Periodic Construction Photographs: Take minimum 20 photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken. Special attention should be paid to documenting conditions that will be inaccessible or difficult to view after being covered or enclosed. For example: plumbing chases, fireproofing, ducts in shafts, site utilities prior to trench backfilling, underslab items (radiant heating loops, utilities, vapor barriers, insulation, etc) prior to concrete pour, and exterior wall water barriers prior to insulation and metal panel installation.

E. Additional Photographs: Architect or Construction Manager may request photographs in addition to periodic photographs specified. Additional photographs will be paid for by Change

Order and are not included in the Contract Sum or in the allowance for construction photographs.

1. Three days' notice will be given, where feasible.
2. In emergency situations, take additional photographs within 24 hours of request.

END OF SECTION 01 32 33

SECTION 01 33 00 - SUBMITTAL PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for submittal of Shop Drawings, Product Data,
Samples, and other miscellaneous quality-control submittals.

B. Shop Drawings include as required, but are not limited to, following:

1. Fabrication drawings.
2. Installation drawings.
3. Setting diagrams.
4. Shopwork manufacturing instructions.
5. Templates and patterns.
6. Schedules.
7. Standard information prepared without specific reference to Project are not Shop Drawings.

C. Product Data include as required, but are not limited to, following:

1. Manufacturer's product specifications.
2. Manufacturer's installation instructions.
3. Standard color charts.
4. Catalog cuts.
5. Roughing-in diagrams and templates.
6. Standard wiring diagrams.
7. Printed performance curves.
8. Operational range diagrams.
9. Mill reports.
10. Standard product operating and maintenance manuals.

D. Samples include as required, but are not limited to, following:

1. Partial Sections of manufactured or fabricated components.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Components used for independent inspection and testing.
7. Field samples.

E. Quality-control submittals include as required, but are not limited to, following:

1. Design data.
2. Certifications.
3. Manufacturer's instructions.
4. Manufacturer's field reports.

F. Administrative submittals include as required, but are not limited to, following:

1. Permits.
2. Applications for payment.
3. Listing of subcontractors.

G. Coordination Drawings

1. Coordination Drawings are in addition to the Shop Drawings, Product Data and Samples required in Division 1 Section, Submittal Procedures. Coordination Drawings are considered to be one form of Shop Drawings.

2. Separate Layers shall be prepared for the following areas of work.
   a. Ductwork, diffuser locations, mechanical piping, mechanical equipment, plumbing and automatic temperature control
   b. Sprinkler System.
   c. Electrical, lighting layouts, speaker layout, sound masking system, emergency lighting and exit signs.
   d. Reflected ceiling plans
   e. Baggage handling systems.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

A. Other Division 1 Specification Sections including, but not limited to, following:

1. Section 01 31 00 Project Management and Coordination: Preparation and submittal of required Coordination Drawings.

2. Section 01 45 00 Quality Control: Submittal of inspection and test reports and erection of field constructed mock-ups.

3. Section 01 33 00 Product Substitution Requirements: Submittal of requests for substitutions.

4. Section 01 77 00 Closeout Procedures: Submittal of Project Record Documents, including copies of final Shop Drawings, at project closeout.

1.3 DEFINITIONS

A. Contractor, as used in this Section, shall mean trade contractors performing Work of this Contract.

B. Coordination Drawings show relationship and integration of different construction elements that require careful coordination during fabrication or installation to fit in space provided or to function as intended.

C. Field samples are full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish standard by which Work will be judged.

D. Mockups are full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

E. Substitutions are deviations from Contract Documents. Submit request for substitution before submittal of affected item. Submit in accordance with requirements of Section 01 33 00. Only substitutions which have been previously accepted shall be included in submittals.

1.4 QUALITY ASSURANCE

A. Perform no portion of Work requiring submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until respective submittal has been accepted by Construction Manager and Engineer/Architect. Such Work shall be in accordance with accepted submittals.

B. Contractor shall not be relieved of responsibility for deviations from requirements of Contract Documents by Construction Manager's and Engineer/Architect's acceptance of Shop Drawings, Product Data, Samples or similar submittals unless Contractor has specifically informed Construction Manager and Engineer/Architect in writing of such deviation at time of submittal and Construction Manager and Engineer/Architect have given written acceptance to specific deviation. Contractor shall not be relieved of

responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by Construction Manager's or Engineer/Architect's acceptance thereof

C. Direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by Construction Manager or Engineer/Architect on previous submittals.

D. Informational submittals upon which Construction Manager and Engineer/Architect are not expected to take responsible action may be so identified in Contract Documents.

E. When professional calculations or certification of performance criteria of materials, Systems or equipment is required by Contract Documents, Construction Manager and Engineer/Architect shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

1.5 SUBMITTAL SCHEDULE

A. After development and acceptance of Contractor's Construction Schedule, prepare Complete schedule of submittals. Submit schedule of submittals to Construction Manager within 10 days of date required for submittal of Contractor's Construction Schedule.

1. Coordinate Submittal Schedule with list of subcontracts, Schedule of Values and list of products as well as Contractor's Construction Schedule.

B. Include each type item for which Contractor's drawings, shop drawings, coordination drawings, product data, samples, certificates of compliance, manufacturer's certificates, warranties, and other types of submittals are required.

C. Allow Construction Manager's and Engineer/Architect's concurrent review of submittals following receipt of submittal, plus time for return to Contractor. Allow additional time for submittals requiring review by Engineer/Architect's consultants.

D. Prepare schedule in chronological order. Provide following information:

1. Scheduled date for first submittal.

2. Related Section number.

3. Submittal category.

4. Name of subcontractor.

5. Description of part of Work covered.

6. Scheduled date for resubmittal.

7. Number of Contractor's drawings, shop drawings, or coordination drawings anticipated within each submittal.

8. Scheduled date for Construction Manager's final release or approval.

9. Material lead time from release of approval date, including delivery to site.

E. Distribution: Following corrections resulting from Construction Manager's and Engineer/ Architect's response to initial submittal, print and distribute copies to Construction Manager, Engineer/Architect, Owner, subcontractors, and other parties required to comply with submittal dates indicated.

1. Post copies in Project meeting room and temporary field office.

2. When revisions are made, distribute to same parties and post in same locations. Delete parties from distribution when they have completed their assigned part of Work and are no longer involved in construction activities.

3. Adhere to accepted schedule except when specifically otherwise permitted.

F. Schedule Updating: Revise schedule after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with report of each meeting.

1.6 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal to Construction Manager sufficiently in advance of scheduled performance of related construction activities to avoid delay.

1. Coordinate each submittal with other submittals and related activities that require sequential activity including:

a. Testing.

b. Purchasing.

c. Fabrication.

d. Delivery.

2. Submit distinct and separate submittal for each element of Work. Do not combine multiple products, systems, or related elements of Work into single submittal.

3. Coordinate transmittal of different types of submittals for same element of Work and different elements of related parts of Work to avoid delay in processing because of Construction Manager or Engineer/Architect's need to review submittals concurrently for coordination.

a. Construction Manager and Engineer/Architect reserve right to withhold action on submittal requiring coordination with other submittals until related submittals are received.

4. Processing: To avoid need to delay installation as result of time required to process submittals, allow sufficient time for submittal review, including time for resubmittals.

a. Allow additional time if Construction Manager or Engineer/Architect must delay processing to permit coordination with subsequent submittals. Construction Management or Engineer/Architect will advise Contractor when submittal being processed must be delayed for coordination.

b. Where necessary to provide intermediate submittal, process intermediate submittal in same manner as initial submittal.

c. Construction Manager will not authorize extension of time because of Contractor's failure to transmit submittals sufficiently in advance of Work to permit processing.

B. Submittal Preparation: Place permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide space on label or beside title block to record action taken by Construction Manager and Engineer/Architect.

3. Include following information on label for processing and recording action taken.

a. Project name.

b. Date.

c. Name and address of Engineer/Architect.

d. Name and address of Contractor.

e. Name and address of subcontractor.

f. Name and address of supplier.

g. Name of manufacturer.

h. Number and title of appropriate Specification Section.

i. Drawing number and detail references, as appropriate.

j. Similar definitive information as necessary.

C. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from Contractor to Construction Manager using form provided by Construction Manager.

1. Record relevant information and requests for data on transmittal form.

2. Include Contractor's certification stating that information submitted complies with requirements of Contract Documents.

3. Construction Manager will return submittals received fro m sources other than Contractor and Engineer/Architect will return submittals received from sources other than Construction Manager.

4. Include submittal Identification Sheet.

D. Resubmittals:

1. Resubmittals must be made using the original submittal number and designation.

2. Subject to same terms and conditions as original submittal.

3. Construction Manager and Engineer/Architect will accept not more than 1 resubmittal.

1.8 SHOP DRAWINGS

A. Submit in form of 6 black-line prints. Blueprints are not acceptable.

B. Submit newly prepared information. Do not reproduce Contract Documents or copy standard printed information as basis of Shop Drawings.

C. Prepare accurately to scale sufficiently large to indicate pertinent aspects of item, adjacent Work of this and other contracts, and method of connection to other Work of this and other contracts.

D. Submit coordination drawings where required for integration of different construction elements.

E. Reference to individual Specification Sections and, where applicable, to detail numbers on Drawings.

F. Include following information on Shop Drawings, as applicable:

1. Dimensions.

2. Identification of products and materials included.

3. Compliance with specified standards.

4. Notation of coordination requirements.

5. Notation of as-built conditions.

6. Notation of dimensions established by field measurement.

G. Do not allow Shop Drawing copies that do not contain appropriate final stamp or other marking indicating action taken by Construction Manager and Engineer/Architect to be used in construction.

H. Highlight, encircle, or otherwise indicate deviations from Contract Documents on Shop

Drawings.

I. Except for templates, patterns, and similar full-size Drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 36 by 48 inches.

1.9 COORDINATION DRAWINGS

A. Refer to 01 31 00 Project Management and Coordination

1.10 PRODUCT DATA

A. Collect Product Data into single submittal for each element of construction or system. Mark each copy to show which choices and options are applicable to Project.

1. Where Product Data includes information on several similar products, some of which are not required for use on Project, mark copies clearly to indicate which products are applicable.

2. Where Product Data must be specially prepared for required products, materials, or systems because standard printed data are not suitable for use, submit as Shop Drawings not Product Data.

3. Include following information in Product Data:

a. Manufacturer's printed recommendations.

b. Compliance with recognized trade association standards.

c. Compliance with recognized testing agency standards.

d. Application of testing agency labels and seals.

e. Approval numbers of organizations or agencies as required by agencies having jurisdiction, including, but not limited to, MEA or BSA numbers for materials, equipment, and assemblies regulated by Building Code of the City of Maine.

f. Notation of dimensions verified by field measurement.

g. Notation of coordination requirements.

4. Do not submit Product Data until compliance with requirements of Contract Documents has been confirmed.

B. Submit preliminary single copy of Product Data where selection of options by Engineer/ Architect is required.

C. Submittals: Submit 7 copies of each required Product Data submittal. Submit 2 additional copies where copies are required for maintenance manuals. Construction Manager and Engineer/Architect will each retain one copy and Construction Manager will return other marked with action taken and corrections or modifications required.

D. Distribution: Furnish copies of final Product Data submittal to manufacturers,

subcontractors, suppliers, fabricators, installers, governing authorities and others as required for performance of construction activities. Show distribution on transmittal forms.

1. Do not proceed with installation of materials, products, and systems until copy of Product Data applicable to installation bearing evidence of Construction Manager's and Engineer/Architect's acceptance is in Installer's possession.

1.11 SAMPLES

A. Submit full-size, fully fabricated Samples, cured and finished in manner specified, and physically identical with material or product proposed for use.

1. Mount, display, or package Samples in manner specified to facilitate review of qualities indicated. Prepare Samples to match Engineer/Architect's sample where so indicated. Include following information:

a. Generic description of Sample.

b. Size limitations.

c. Sample source.

d. Product name or name of manufacturer.

e. Compliance with recognized standards.

f. Compliance with governing regulations.

g. Availability.

h. Delivery time.

i. Attach 3 by 4 inch blank tag for action stamps.

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

a. Where variation in color, pattern, texture, or other characteristic is inherent in material or product represented by Sample, submit at least 3 multiple units that show approximate limits of variations.

b. Refer to other Specification Sections for requirements for Sample Installations that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Specification Sections for Samples to be returned to Contractor for incorporation in Work, if any. Such Samples must be in undamaged condition at time of use. On transmittal form, indicate such special requests about disposition of Sample submittals.

d. Samples not incorporated into Work, or otherwise designated as Owner's property, are property of Contractor and shall be removed from site prior to Substantial Completion.

B. Preliminary Submittals:

1. Unless precise color, pattern, and texture or similar characteristics are specifically described, submit single, full set of available choices for material or product.

2. Preliminary submittals will be reviewed and returned with Engineer/Architect's marking indicating selection and other action taken.

3. Engineer/Architect reserves right not to make individual determination or selections until preliminary or final samples of related materials are submitted. Determination of related materials at Engineer/Architect’s sole discretion.

C. Submit 4 samples, 1 of which will be returned, except as noted.

1. Maintain sets of Samples, as returned by Construction Manager, at Project Site, available for quality-control comparisons throughout course of construction activity.

2. Sample sets may be used to obtain final acceptance of construction associated with each set.

D. Distribution of Samples: Distribute additional sets of Samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for performance of Work. Show distribution on transmittal forms.

E. Sample Installations specified in individual Specification Sections are special types of Samples. Comply with Sample submittal requirements to fullest extent possible.

1. Process transmittal forms to provide record of activity.

2. Install samples in locations as directed, complete and finished.

1.12 QUALITY ASSURANCE SUBMITTALS

A. Submit quality-control submittals, including design data, certifications, manufacturer's instructions, manufacturer's field reports, laboratory tests, approval numbers, research report numbers, listings, approved assembly descriptions, and other quality-control submittals as requested by Construction Manager or Engineer/Architect, as required by agencies having jurisdiction, or as required under other Sections of Specifications.

B. Certifications: Where other Sections of Specifications require certification that product, material, or installation complies with specified requirements, submit notarized certification from manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by officer of manufacturer or other individual authorized to sign documents on behalf of company.

1.13 CONTRACTOR’S REVIEW

A. Review submittals for accuracy, completeness, and conformity with Contract Documents.

1. Submittal shall be construed as stipulating Contractor has thoroughly and completely reviewed, and coordinated data.

2. Submittals indicating less than Contractor's full compliance will be returned without action.

3. Delays caused by failure to comply will not be acceptable basis for extension of Completion Time.

B. Certify submittals have been reviewed and coordinated by adding affidavit to each submittal stating, "The undersigned certifies this submittal has been reviewed, approved, and coordinated in compliance with requirements of Section 01 33 00." Affidavit shall be signed and dated.

C. Submittal Log: Maintain accurate submittal log for duration of Contract. Indicate current status of submittals at all times. Make submittal log available for Construction Manager's or Engineer/Architect's review upon request.

1.14 MANAGING GENERAL CONTRACTOR'S AND ENGINEER/ARCHITECT'S ACTION

A. Except for submittals for record or for information, where action and return of submittals is required, Construction Manager and Engineer/Architect will review each submittal, mark to indicate action taken, and return.

1. Compliance with specified characteristics is Contractor's responsibility and not considered part of Construction Manager's or Engineer/Architect's review and indication of action taken.

2. Acceptance of submittals with deviations shall not relieve Contractor from responsibility for additional costs of changes required to accommodate such deviations. Deviations included in submittals without prior acceptance are excepted from review of submittals whether noted or not on returned copy.

3. Review of separate item shall not indicate acceptance of assembly of which item is part.

4. Make only those revisions required or accepted by Construction Manager or Engineer/Architect.

5. Notations by Construction Manager or Engineer/Architect, which increase Contract Cost or Contract Time shall be brought to Construction Manager's and Engineer/Architect's attention, in writing, before proceeding with Work.

6. When professional certification of performance criteria of materials, systems or equipment is required by Contract Documents, Construction Manager and Engineer/Architect shall be entitled to rely upon accuracy and completeness of such calculations and certifications.

B. Action Stamp: Engineer/Architect will stamp each submittal with uniform, action stamp.

Engineer/Architect will mark stamp appropriately to indicate action taken, as follows:

1. A “NO EXCEPTION TAKEN": means that no further review of the Submittal is required. Manufacture or construction may proceed providing that Work complies with the Contract Documents and the reviewed submittal.

2. B "MAKE CORRECTIONS AS NOTED means that fabrication, manufacture or construction may proceed providing submittal complies with the Architect's notations and the Contract Documents. If, for any reason, the Contractor cannot comply with the notations, the Contractor shall make revisions and resubmit as described for submittals stamped "Revise and Resubmit".

3. C "REVISE AND RESUBMIT": means that fabrication, manufacture or construction may not proceed until the Contractor demonstrates compliance with the Architect's notations and the requirements of the Contract Documents sited. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat, if necessary, to obtain compliance with the Contract Documents. If, for any reason, the Contractor cannot comply with the notations of the Architect or the requirements of the Contract Documents, the Contractor shall advise the Architect in writing of the reason that compliance cannot be achieved and make recommendations that would allow the Contractor's compliance.

4. D "RESUBMIT PROPERLY": means that the submittal does not comply with the design intent of the Contract Document, or does not contain the Contractor's signature indicating that it has been review and approved by the Contractor. Submittals stamped "Resubmit Properly" are not to be used. Contractor shall make revisions to comply with the requirements of the Contract Documents and resubmit.

5. E “NOT REVIEWED”, means that the submittal is not required by the Contract Documents.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION 01 33 00

SECTION 01 45 00 -QUALITY CONTROL

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All work specified herein shall comply with the requirements of the City of Portland, FAA, and the related Contract Documents.

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for quality control Services.

B. Quality control services include inspections and tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by the Engineer.

C. Inspection and testing services when specified are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.

2. Inspections, test and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.

3. Requirements for the Contractor to provide quality control services required by the Engineer or authorities having jurisdiction are not limited by provisions of this Section.

1.3 RESPONSIBILITIES

A. Owner Responsibilities: The Owner shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, or are provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Owner.

1. The Owner shall employ and pay an independent agency, to perform specified quality control services, see the respective specification sections where applicable.

2. Any Laboratory that is to provide required testing of materials and structures for the Contractor shall be accredited by the National Voluntary Laboratory Accreditation Program of the National Bureau of Standards.

3. Any Laboratory that is to provide required testing of materials and structures for the Contractor shall have a Professional Engineer who is currently licensed in the State of Maine certify test and reports as required by the Engineer.

4. Contractor shall perform a pre-blast conditions survey per 31 23 16 Rock Removal specification.

B. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.

1. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

C. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:

1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.

2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.

3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.

4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

5. Security and protection of samples and test equipment at the Project site.

D. Owner's Responsibilities: The Owner will engage a testing laboratory to perform inspections, tests and similar quality control services specified to be performed by the Owner’s independent testing laboratory and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services shall not be included in the Contract Sum.

E. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

1. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

2. The Supplier of any and all materials to be used by the Contractor in carrying out the construction requirements of this contract shall be required to be on file with the specified testing authorities.

F. Duties of the Testing Agency: The independent testing agency engaged to perform inspections, sampling and testing of materials and construction specified in individual Specification Sections shall cooperate with the Engineer and Construction Manager in performance of its duties, and shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Engineer and Construction Manager promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents, or approve or accept any portion of the Work.

3. The agency shall not perform any duties of the Contractor.

1.4 SUBMITTALS

A. The Contractor shall submit a certified written report of each inspection, test or similar service it is responsible for to the Construction Manager, in duplicate, immediately following said tests.

1. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:

a. Date of issue.

b. Project title and number.

c. Name, address and telephone number of testing agency.

d. Dates and locations of samples and tests or inspections.

e. Names of individuals making the inspection or test.

f. Designation of the Work and test method.

g. Identification of product and Specification Section.

h. Complete inspection or test data.

i. Test results and interpretations of test results.

j. Ambient conditions at the time of sample-taking and testing.

k. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.

l. Name and signature of inspector.

m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualification for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State of Maine.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with contract document requirements for "Cutting and Patching."

B. Protect construction exposed by or for quality control service activities, and protect repaired construction.

C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. All work specified herein shall comply with the requirements of the City of Portland, FAA, and the related Contract Documents.

1.2 SUMMARY

A. 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 the Contract Documents.

B. The Contractor shall arrange for, provide and maintain temporary facilities and controls as required for the proper and expeditious prosecution of the Work. Pay all costs including fuel, power and water used until final acceptance of the Work unless the Owner makes arrangements for the use of completed portions of the Work after Substantial Completion in accordance with the provisions of the General Conditions.

C. The Contractor shall provide and maintain all temporary connections to utilities and services in locations acceptable to the Owner, Engineer/Architect and local authorities having jurisdiction thereof. Make all installations in a manner subject to the acceptance of such authorities, the Construction Manager and the Architect/Engineer. The Contractor shall remove temporary installations and connections when no longer required and restore the services and sources of supply to proper operating condition.

1.4 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.

1.5 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to:

1. Building Code requirements.
2. Health and safety regulations.
3. Utility company regulations.
4. Police, Fire Department and Rescue Squad rules.
5. Environmental Protection regulations.

B. Standards: Comply with NFPA Standard 241: “Safeguarding Construction, Alteration and

Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."

1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services", prepared jointly by AGC and ASC, for industry recommendations.

2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with National Electric Code (NFPA 70).

C. Inspections: If required, arrange for authorities having jurisdiction to inspect temporary utility before use. Obtain required certifications and permits where necessary.

1.6 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for use and extent of use of each temporary utility.

B. Notify Construction Manager of any proposed shutdown of existing utilities 72 hours (3 full work days) in advance of same.

C. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not overload facilities, or permit them to interfere with progress. Do not allow hazardous dangerous or unsanitary conditions, or public nuisances to develop or persist on the site and/or in the area of the work.

PART 2 PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Architect/Engineer, undamaged previously used materials in serviceable condition may be used. Provide materials suitable for the use intended.

B. Lumber and Plywood: Comply with requirements in Section 061053 – Miscellaneous Rough Carpentry.

1. For safety barriers and barricades and similar uses, provide minimum 5/8" thick plywood. All temporary wood members shall be fire retardant treated material.

C. Tarpaulins: For weatherproof enclosures provide waterproof, fire-resistant, UL labeled tarpaulins with flame-spread rating of 15 or less. Tarpaulins shall be translucent nylon reinforced laminated fire retardant polyethylene.

2.2 EQUIPMENT

A. General:

1. Construction Manager shall furnish and maintain, at his own cost and risk, all tools, apparatus, appliances, hoists and/ or cranes and fuel or power for same, scaffolding,

runways, ladders, temporary supports, bracing, and all other similar work or material necessary to insure speed, convenience, and safety in the execution of this Contract.

2. Responsibility for proper design, strength, and safety shall remain with the Contractor.

3. All such items shall comply with OSHA regulations and all other applicable codes, statutes, rules and regulations.

B. Heating Units: Provide portable temporary heating units that have been tested and labeled by UL, FM or another recognized trade association related to the type of fuel being consumed.

1. Heating units shall be provided in the area of the work when and where required due to climatic conditions, unless otherwise accepted by the Engineer.

C. First Aid Supplies: Comply with governing regulations.

D. Water Hoses: Provide 3/4 in. heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than the maximum pressure of the water distribution system; provide adjustable shut-off nozzles at hose discharge.

E. Electrical Outlets: Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 volt plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button and pilot light, for connection of power tools and equipment.

F. Electrical Power Cords: Provide grounded extension cords; use “hard-service” cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.

G. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered glass enclosures, where exposed to breakage. Provide exterior fixtures where exposed to moisture.

H. Fire Extinguishers: Provide hand-carried, portable UL-rated, class “ABC” dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.

1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where the company provides only part of the service, provide

the remainder with matching, compatible materials and equipment; comply with the company's recommendations. Construction Manager shall bear the cost of all temporary meters, utilities, connection fees, utility backcharges, engineering fees, and energy costs related to temporary facilities and controls. Meters shall be read monthly.

1. Arrange with the company and Construction Manager for a time when service can be interrupted, where necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction.

B. Temporary Electric Power Service: Provide weatherproof, grounded electric power service of sufficient size, capacity, and power characteristics during construction period. Provide all labor and/or materials for same.

C. Temporary Lighting: Install and operate temporary lighting that will fulfill security and protection requirements, without operating the entire system, and will provide adequate illumination for construction operations and traffic conditions.

D. Make all arrangements with the local electric company or other appropriate entity for temporary electrical service to the construction site, provide all equipment necessary for temporary power and lighting. The electrical service shall be of adequate capacity for all construction tools and equipment without overloading the temporary facilities and shall be made available for power, lighting and construction operations of all trades.

E. In addition to the electrical service, provide power distribution as required throughout structure of 120/208 volts, 3-phase, 4-wire, 60 cycle, A.C. The termination of power distribution shall be at convenient locations in the building. Provide terminations for each voltage supply complete with circuit breakers, disconnect switches and other electrical devices as required to protect the power supply system.

F. Provide and maintain a temporary lighting system to satisfy at least the minimum requirements of safety and security, and to maintain the progress of the Work. The temporary lighting system shall afford general illumination in all areas of the Project and any additional illumination, where necessary, in the areas of the Project where work is being performed.

G. All temporary wiring shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property.

H. The permanent power and lighting system, or a portion thereof, may be used provided the Contractor: (1) obtains the approval of the Owner; (2) assumes full responsibility for the entire power and lighting system; and (3) pays costs for power, operation, maintenance and restoration of the system.

I. At the completion of the Work remove all temporary electrical equipment and wiring and replace all worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

3.3 TEMPORARY HEAT AND ENCLOSURES

A. Temporary Heat: Provide temporary heat required by construction activities. Select safe equipment that will not have a harmful effect on completed installations or elements being

installed. Coordinate ventilation requirements to produce the ambient condition required and minimize consumption of energy.

1. All temporary heating shall comply with OSHA regulations and all other applicable codes, statutes, rules and regulations.

2. In any event, provide temporary heating of interior building in the areas of work as necessary. Windows, doors, ventilators and similar openings shall be temporarily closed. Sufficient heat shall be provided to maintain proper temperature as conditions require.

3. The Contractor shall bear the costs in connection with the furnishing of temporary heat as herein required including the cost of labor, materials, equipment and fuel consumed.

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

1. Where heat is needed and the permanent building enclosure requires openings, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

2. Install tarpaulins securely, with incombustible wood framing and other materials. Close openings of 25 square feet or less with plywood or similar materials.

3. All openings through roof decks shall be closed with load-bearing wood-framed construction.

C. The permanent air circulation system, or a portion thereof, may be used provided the Contractor: (1) obtains the approval of the Owner; (2) assumes full responsibility for the entire air circulation system; and (3) pays costs for power, operation, maintenance and restoration of the system. Provide temporary filters to adequately filter air being distributed through the duct work to the supply outlets; disposable filters shall be placed in front of all exhaust registers to keep construction dirt out of exhaust duct work. Thoroughly clean the interior of the air handling units and install the permanent filters prior to acceptance of the Work.

D. At the completion of the Work remove all temporary heating equipment and piping and replace all worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

3.4 TEMPORARY WATER

A. Provide, at a point within 10 ft. of the building (or buildings), all water necessary for construction purposes. Make all temporary connections to existing mains; provide temporary meter; and make arrangements and pay for the temporary water service including cost of installation, maintenance thereof and water used.

B. Furnish drinking water with suitable containers and cups for use of employees. Locate drinking water dispensers where work is in progress.

C. The permanent water supply and distribution system, or a portion thereof, may be used

provided the Contractor: (1) obtains the approval of the Owner; (2) assumes full responsibility for the entire water supply and distribution system; and (3) pays costs for water, operation, maintenance and restoration of the system.

D. Make provisions for drainage or collection of excess or spilled water.

E. At the completion of the Work, remove all temporary water service equipment and piping and replace all worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

3.5 TEMPORARY SANITARY FACILITIES

A. Provide enclosed weathertight toilets for the use of all construction personnel, complete with fixtures, water connections, sewer connections and all appurtenances. Maintain toilets in accordance with the requirements of the state and local health regulations and ordinances. Upon completion of the Work, remove toilets and their appurtenances. Chemical toilets will be permitted.

3.6 SECURITY AND PROTECTION

A. Temporary Fire Protection: The Contractor shall, during the progress of construction, assume all responsibilities in the area of work for loss or damage by fire to the work included in this contract until completion of the contract.

1. Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguishers," and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."

2. Locate fire extinguishers where convenient and effective for their intended purpose.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, and other access routes for fighting fires. Prohibit smoking in all interior spaces.

4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

B. Barricades, Warning Signs and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed provide lighting, including flashing red or amber lights.

C. Protection from theft and vandalism: The Contractor shall be solely responsible for damage, loss or liability due to theft or vandalism.

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

2. Storage: Where materials and equipment must be stored, and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation

and release of material to minimize the opportunity for theft and vandalism.

D. Environmental Protection: Provide protection, operate temporary facilities and conduct construction in ways and by methods that comply with environmental regulations, and minimize the possibility that air, might be contaminated or polluted, or that other undesirable effects might result. Avoid use of tools and equipment which produce harmful and/or destructure noise.

1. Dust Control: The Contractor shall provide materials and equipment to maintain effective dust control.

E. Provide openings in slabs, walls and partitions where required for moving in large pieces of equipment. After the equipment is in place, close all openings and restore finish work to original condition. Maintain fire rating of existing rated construction utilizing firestopping as specified in Section “Firestopping”. Structural modifications shall be subject to review by the Engineer.

F. Provide material hoists and special rigging and hoisting facilities as required. Provide all necessary guards, signals, safety devices, etc. required for safe operations, and suitable runways from the hoists to each floor level and roof. Prohibit the use of the material hoists for transporting personnel.

G. Provide and maintain a temporary fence to enclose the area at the job site and to effectively guard and close in the designated area. Provide gates of substantial construction, crossbraced, hung on heavy strap hinges, with suitable hasps and padlocks. Submit shop drawings of fence and gates for review by the Construction Manager, the Architect/ Engineer and the Owner. Paint the fence with two coats of paint in color selected by the Engineer.

H. Remove the fence upon completion of the Work or at such time before final completion as directed by the Owner.

3.7 TEMPORARY STAIRS, LADDERS, RAMPS, RUNWAYS, COVERED WALKWAY, ETC.

A. Provide and maintain all equipment such as temporary stairs, ladders, ramps, runways, chutes, etc. as required for the proper execution of the Work.

B. As soon as permanent stairs are erected, provide temporary protective treads, handrails and shaft enclosures.

3.8 OPERATION, TERMINATION AND REMOVAL

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

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation and similar facilities for the area of work under the Contract on a 24-hour day basis where required to achieve indicated results and to avoid possibility of damage.

C. Termination and Removal: Unless otherwise requested by the Engineer remove each temporary facility when the need has ended, or when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces and replace construction that cannot be satisfactorily repaired.

1. Materials and supplies that constitute temporary facilities are property of the Contractor. At Substantial Completion, clean and renovate permanent facilities that have been used during the construction period.

3.9 PEST CONTROL

A. Institute an effective program of pest control for the entire site within the construction limits. Cooperate with local authorities and provide the regular services of an experienced exterminator who shall visit the site at least once a month for the entire construction period. If the program of pest control is not effective, take whatever steps are necessary to rid the Project of pests without additional expense to the Owner.

3.10 SURFACE WATER AND SNOW CONTROL

A. Provide, maintain and operate a temporary drainage system and pumping equipment as required, to keep excavated areas free from water from any source; remove all water from basement areas, tunnels, pits, trenches and similar areas. Perform pumping and draining in such a manner so as not to damage any part of the Work adjacent construction or property.

B. Temporary sump pumps may be installed and operated in the sump pits. Upon the installation of the permanent sump pumps, remove the temporary pumps, clean the sump pits and the drain lines. Under no condition shall the permanent sump pumps be used for such temporary purposes.

C. Remove snow and ice as necessary for the protection and prosecution of the Work.

3.11 PROJECT IDENTIFICATION AND SIGNS

A. No signs or advertisements will be allowed to be displayed on the premises without the acceptance of the Engineer and Owner.

B. Provide two construction signs subject to the review of the Engineer and the approval of the Owner. Text and lettering shall be as provided for at a later date.

C. Erect the construction sign on the site where directed, approximately 4 ft. x 8 ft., of 3/4 in. exterior grade plywood with suitable frame, moldings and supports. Use Douglas Fir Overlaid Plywood, Grade B-B High Density, Exterior, good two sides. The sign shall be primed and given two coats of approved white paint. Lettering shall be black of an approved type, size and layout as directed by the Architect. Sign shall contain a color image provided by architect, contain the name of the building, Owner, Architect, Engineers, Contractor and such other reasonable information the Owner may require.

END OF SECTION

SECTION 01 60 00 - PRODUCT REQUIREMENTS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements governing Contractor's selection of products, product delivery, storage and handling for use in Project.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 RELATED SECTIONS

A. Other Division 1 Specification Sections including, but not limited to, following:

1. Section 01 25 13 Product Substitution Procedures.

1.4 DEFINITIONS

A. Definitions used in this Article are not intended to change meaning of other terms used in Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well recognized meanings in construction industry.

1. Products: Items purchased for incorporation in Work, whether purchased for Project or taken from previously purchased stock. Term "product" includes terms "material," "equipment," "system," and terms of similar intent.

a. Named Products: Items identified by manufacturer's product name, including make or model number or other designation, shown or listed in manufacturer's published product literature, that is current as of date of Contract Documents.

2. Materials: Products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form part of Work.

3. Equipment: Product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.5 SUBMITTALS

A. Product List: Prepare list showing products specified in tabular form acceptable to Construction Manager and Architect/Engineer. Include generic names of products required. Include manufacturer's name and proprietary product names for each item listed

1. Coordinate product list with Contractor's Construction Schedule and Schedule of Submittals.

2. Tabulate information for each product under following column headings:

   a. Related Specification Section number.

   b. Generic name used in Contract Documents.

   c. Proprietary name, model number, and similar designations.

   d. Manufacturer's name and address.

   e. Supplier's name and address.

   f. Installer's name and address.

   g. Projected delivery date or time span of delivery period.

3. Initial Submittal: Within 15 days after Notice to Proceed, submit 3 copies of initial product list to Architect/Engineer through Construction Manager. Provide written explanation for omissions of data and for known variations from Contract requirements in accordance with Section 016000.

   a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Construction Manager and Architect/Engineer will respond in writing within 2 weeks of receipt of initial product list. No response within this period shall not be regarded as approval for substitutions not specifically accepted by Architect/Engineer. Architect/Engineer's response will include list of unacceptable product selections, containing brief explanation of reasons for rejection.

5. Completed List: Within 30 days after Notice to Proceed, submit 3 copies of completed product list to Architect/Engineer through Construction Manager.

1.6 QUALITY ASSURANCE

A. Compatibility of Options: When given option of selecting between 2 or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.

B. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on exterior.

1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.

2. Equipment Nameplates: Provide permanent nameplate on each item of service connected or power-operated equipment. Locate on easily accessible surface that is inconspicuous in occupied spaces. Nameplate shall contain following information and other essential operating data:

a. Name of product and manufacturer.

b. Model and serial number.

c. Capacity.

d. Speed.

e. Ratings.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.

1. Schedule delivery to minimize long-term storage at project site and to prevent overcrowding of construction spaces.

2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to project site in undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.

4. Inspect products upon delivery to ensure compliance with Contract Documents and to ensure that products are undamaged and properly protected.

5. Store products in manner that will facilitate inspection and measurement of quantity or counting of units.

6. Store materials in manner that will not endanger project structure.

7. Store products subject to damage by elements above ground, under cover in weathertight enclosure, with ventilation adequate to prevent condensation. Comply with product manufacturer’s written instructions for temperature, humidity, ventilation, and weather protection requirements for storage.

8. Protect stored products from damage.

1.8 ENVIRONMENTAL REQUIREMENTS

A. General: Interior construction materials, finishes, and furnishings, including partitions, partition coverings, flooring, floor coverings, wall covering, ceiling tiles, adhesives, sealants, glazes, paints, and similar materials shall be designed, manufactured, handled, and installed in such a manner to produce least harmful or annoying effect on occupants of building.

1. Written notification of these requirements to suppliers of these materials shall be made to assure that compliance is obtained from manufacturers.

2. Materials must emit lowest, yet technologically achievable emissions of particles and chemical vapors. As a minimum, materials shall meet emission rate standards set forth below. Emission rate calculations shall assume station volume of 900 cubic feet for determination of product loading.

C. Carcinogenic and Toxic Materials: For interior design materials, furnishings, and finishes, Contractor shall disclose in writing to Owner prior to installation of such materials, furnishing and finishes, any detectable amounts of substances emitted into indoor air which are listed on any of following:

1. International Agency for Research on Cancer list of Chemical Carcinogens.

2. Carcinogen List of National Toxicology Program.

3. Reproductive Toxin List of Catalog of Teratogenic Agents.

D. Emission Rate Test Methods: Emission rate testing pursuant to Specification shall be completed according to dynamic environmental chamber technology as prescribed by U.S. Environmental Protection Agency (EPA-600/8-89-074) and data shall be made available to Owner for review and approval.

E. "Dry" Materials: "Dry" furnishing and finishing materials including, but not limited to, carpet, acoustical panels, and textiles shall not be installed until "wet" materials including, but not limited to, adhesives, sealants, glazes, caulks, and paint have been applied and allowed to dry to extent feasible and in accordance with other good building practices. Drying times should be chosen so that pollutant emission rates as specified are achieved prior to installation of "dry" furnishing and finishing materials.

F. Pre-Conditioning: Dry furnishing and finishing materials shall be allowed to "air out" or pre-condition prior to installation in building.

PART 2 PRODUCTS

2.1 PRODUCT OPTIONS

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

1. Provide products complete with accessories, trim, finish, safety guards, and other items needed for complete installation and intended use and effect.

2. Standard Products: If available, and unless custom products or non standard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Contract Documents and governing regulations govern product selection. Procedures governing product selection include following:

1. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in Work, but do not restrict Contractor to use of

these products only, Contractor may propose any available product that complies with Contract requirements. Comply with Section 01 25 13 to obtain approval for use of unnamed product.

2. Products Specified by Indicating Basis for Design: Design and approval is based on systems, products, and assemblies of manufacturer indicated. Equivalent systems, products, and assemblies of other manufacturers named as acceptable manufacturers may be used, however, Contractor is responsible for additional approvals required, for coordination with remainder of Contract Documents, and for costs of redesign or recalculation required. Comply with Section 01 25 13 to obtain approval for use of product or manufacturer not named as acceptable manufacturer.

3. Descriptive Specification Requirements: Where Specifications describe product or assembly, listing exact characteristics required, with or without use of brand or trade name, provide product or assembly that provides characteristics and otherwise complies with Contract requirements.

4. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by manufacturer for application indicated.

   a. Manufacturer's recommendations may be contained in published product literature or by manufacturer's certification of performance.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with imposed code, standard, or regulation, select product that complies with standards, codes, or regulations specified.

6. Visual Matching: Where Specifications require matching established Sample, Architect/ Engineer's decision will be final on whether proposed product matches satisfactorily.

   a. Where no product available within specified category matches satisfactorily and complies with other specified requirements, comply with provisions of Section 01 25 13 for selection of matching product in another product category.

7. Visual Selection: Where specified product requirements include phrase "... as selected from manufacturer's full range of available colors, patterns, textures..." or similar phrase, select product and manufacturer that complies with other specified requirements and submit full range of available colors, patterns, textures, and the like, for Design Professional selection.

8. Allowances: Refer to individual Specification Sections for allowances that control product selection and for procedures required for processing such selections.

PART 3 EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer’s instructions and recommendations for installation of products in applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.

1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION

SECTION 01 73 00 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Progress cleaning.
5. Starting and adjusting.
6. Protection of installed construction.
7. Correction of the Work.
8. Establishing benchmarks, current elevations with structures to remain and monitoring any settlement during demolition or new construction.
9. Land survey work.
10. Civil Engineering services.
11. Structural engineering services
12. Professional engineering services required by public authorities having jurisdiction.

1.2 SUBMITTALS

A. Qualification Data: For land surveyor or professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor or professional engineer certifying that location and elevation of improvements comply with requirements.

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

1.3 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in the state of Maine and who is experienced in providing land-surveying services of the kind indicated.

B. Engineer Qualifications: A professional engineer who is legally qualified to practice in the state of Maine and who is experienced in providing engineering services of the kind indicated.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services. Preserve permanent reference points during demolition. Do not change or relocate benchmarks or control points without prior written approval.

2. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points.

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

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.

2. Dig Safe- Prior to any excavation, Contractor shall notify 1-888 Dig Safe (344-7233) of the location of the intended excavation on the public (landside) site area at least 72 hours, not including Saturdays, Sundays and legal Maine holidays, but not more than 30 calendar days, prior to the commencement of excavation. Notification may be given in writing, by telephone, or by electronic means. Non-emergency notification shall take place between the hours of 7 a.m. and 5 p.m. An excavator shall acquire and record an acknowledgement from Dig Safe for any notice the excavator sends by electronic means. On the secure

airside portion of the site, contractor shall coordinate with private surveyor under contract with the Owner.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

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

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.
b. List of detrimental conditions, including substrates.
c. List of unacceptable installation tolerances.
d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner and Port Authority that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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 Construction Manager not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Construction Manager's written permission.

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

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

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Construction Manager promptly.

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

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Construction Manager when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

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

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

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Construction Manager.

3.4 FIELD ENGINEERING

A. Identification: Owner and Port Authority will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Construction Manager before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

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

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

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

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

3.5 INSTALLATION

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

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

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

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

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

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

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

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

2. Allow for building movement, including thermal expansion and contraction.

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

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 PROGRESS CLEANING

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

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

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

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

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

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

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

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

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

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

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

3.7 STARTING AND ADJUSTING

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

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

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

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 1 Section "Quality Requirements."

3.8 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.9 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 1 Section "Cutting and Patching."

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

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

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

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

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

END OF SECTION

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 DEFINITIONS

A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

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

1.3 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 3 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.

1.4 QUALITY ASSURANCE

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

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

C. Miscellaneous Elements: Do not cut and patch elements or related components in a manner that could change their load-carrying capacity, that results in reducing

their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed. See section 02 41 19 for Hazardous Materials information.

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

3.2 PREPARATION

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

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

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

3.3 PERFORMANCE

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

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

B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review

proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
2. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

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

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

END OF SECTION

SECTION 01 74 19 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for the following:

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

B. Related Sections:

1. Division 02 Section "Selective Structure Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
2. Division 04 Section "Concrete Unit Masonry" for disposal requirements for masonry waste.
3. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

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

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

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

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

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

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of ninety-five (95) percent by weight of total non-hazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

1.4 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 30 days of date established for the Notice of Award.

1.5 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste salvaged, both estimated and actual in tons.
5. Quantity of waste recycled, both estimated and actual in tons.
6. Total quantity of waste recovered (salvaged plus recycled) in tons.
7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

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

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

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

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

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

G. LEED Submittal: LEED letter template for Credit MR 2.1 and 2.2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.

H. Qualification Data: For waste management coordinator.

I. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that

recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.6 QUALITY ASSURANCE

A. Waste Management Coordinator Qualifications: LEED Accredited Professional, certified by USGBC. Waste management coordinator may also serve as LEED coordinator.

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

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

1.7 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan according to ASTM E 1609 and requirements of this Section. Plan shall consist of waste identification, waste reduction work plan, and cost/revenue analysis. Distinguish between demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

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

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

B. Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan.

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

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

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

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

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

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

C. Salvaged Items for Owner's Use:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.

4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

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

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

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

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

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

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

3.4 RECYCLING DEMOLITION WASTE

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

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

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

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

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

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

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

F. Metals: Separate metals by type.

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

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

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

I. Metal Suspension System: Separate metal members including trim, and other metals from acoustical panels and tile and sort with other metals.

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

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

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

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

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

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

B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

C. Wood Materials:

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

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

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

3.6 DISPOSAL OF WASTE

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

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

B. Burning: Do not burn waste materials.

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

3.7 SAMPLE FORMS

END OF SECTION 01 74 19

SECTION 01 77 00 - CLOSEOUT PROCEDURES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for Substantial Completion and Final Acceptance.

B. Closeout requirements for specific construction activities are included in appropriate Sections in Divisions 2 through 34.

C. Certifcate of Occupany shall be issued by the City of Portland.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete following, as appropriate to Project. List exceptions in request.

1. In Application for Payment that coincides with, or first follows, date Substantial Completion is claimed, show 100 percent completion for portion of Work claimed as substantially complete.

    a. Include supporting documentation for completion as indicated in Contract Documents and statement showing accounting of changes to Contract Sum.

2. If 100 percent completion cannot be shown, include comprehensive list of incomplete items, value of incomplete construction, and reasons Work is not complete.

3. Advise Owner of pending insurance changeover requirements, if any.

4. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications, and similar documents.

5. Obtain and submit releases enabling Owner unrestricted use of Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

6. Deliver tools, spare parts, extra stock, and similar items.

7. Make final changeover of permanent locks and transmit keys to Owner. Advise Owner's personnel of changeover in security provisions.

8. Complete startup testing of systems and instruction of Owner's operation and maintenance personnel. Discontinue and remove temporary facilities from site, along with mockups, construction tools, and similar elements.

9. Touch up and otherwise repair and restore marred, exposed finishes.

B. Inspection Procedures: On receipt of Construction Manager's comprehensive list of items to be completed or corrected and request for inspection, Engineer/Architect will advise Construction Manager of unfilled requirements or proceed with inspection. Engineer/Architect will prepare Certificate of Substantial Completion following inspection or advise Construction Manager of construction that must be completed or corrected
before certificate will be issued.

1. Engineer/Architect will repeat inspection when requested and assured that Work is substantially complete.

2. Engineer/Architect will make if necessary 1 repeat inspection.

3. Results of completed inspection will form basis of requirements for final acceptance.

1.4 FINAL ACCEPTANCE

A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete following as applicable to Project. List exceptions in request.

1. Submit final payment request with releases and supporting documentation not previously submitted and accepted. Include insurance certificates for products and completed operations where required.

2. Submit updated final statement, accounting for final additional changes to Contract Sum.

3. Submit list of items to be completed or corrected from earlier inspections indicating completed items and items remaining to be completed.

a. For items remaining to be completed, indicate value of incomplete Work, reasons Work is not complete, and date by which Work will be complete.

4. Submit record drawings, maintenance manuals, testing reports, final project photographs, damage or settlement surveys, property surveys, and similar final record information

5. Submit final meter readings for utilities, 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 Work.

6. Submit consent of surety to final payment.

7. Submit final liquidated damages settlement statement.

8. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

9. Submit LEED documentation per 01 81 13 and Division 2 through 34.

B. Inspection Procedure: Engineer/Architect will inspect Work upon receipt of notice from Construction Manager that Work has been completed, except for items whose completion is delayed under circumstances acceptable to Engineer/Architect. Engineer/Architect will advise Contractor of unfilled requirements or proceed with inspection Engineer/Architect will prepare certificate of final acceptance following inspection or advise Construction Manager of construction that must be completed or corrected before certificate will be issued.

1. Engineer/Architect will repeat inspection when requested and assured that Work is complete.

2. Engineer/Architect will make if necessary 1 repeat inspection.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for following as required by other sections:

1. Preparing and submitting operation and maintenance manuals for building operating systems and equipment.

2. Preparing and submitting instruction manuals covering care, preservation, and maintenance of architectural products and finishes.

3. Instruction of Owner's operating personnel in operation and maintenance of building systems and equipment.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 RELATED SECTIONS

A. Appropriate Sections of Divisions 2 through 34 specify special operation and maintenance data requirements for specific pieces of equipment or building operating systems.

1.4 QUALITY ASSURANCE

A. Maintenance Manual Preparation: In preparation of maintenance manuals, use personnel thoroughly trained and experienced in operation and maintenance of equipment or system involved.

1. Where maintenance manuals require written instructions, use personnel skilled in technical writing where necessary for communication of essential data.

2. Where maintenance manuals require drawings or diagrams, use draftsmen capable of preparing drawings clearly in understandable format.

B. Instructions for Owner's Personnel: Use experienced instructors thoroughly trained and experienced in operation and maintenance of equipment or system involved to instruct Owner's operation and maintenance personnel.

1.5 SUBMITTALS

A. Submittal Schedule: Comply with following schedule for submitting operation and maintenance manuals:

1. Before Substantial Completion, when each installation that requires operation and

maintenance manuals is nominally complete, submit to Construction Manager 4 draft copies of each manual, 2 for Construction Manager and 2 for Engineer/ Architect for review. Include complete index or table of contents of each manual.

a. Construction Manager and Engineer/Architect, through Construction Manager, will each return 1 copy of draft with comments within 15 days of receipt.

2. Submit, as specified above, copies of data in final form at least 15 days before final inspection. Construction Manager and Engineer/Architect, through Construction Manager, will each return 1 copy of draft with comments.

3. After final inspection, make corrections or modifications to comply with comments. Submit 4 copies of each approved manual to Construction Manager within 15 days of receipt of comments.

B. Form of Submittal: Prepare operation and maintenance manuals in form of instructional manual for use by Owner's operating personnel. Organize into suitable sets of manageable size. Where possible, assemble instructions for similar equipment into single binder.

1. Binders: For each manual, provide heavy-duty, commercial-quality, 3-ring, vinylcovered, loose-leaf binders, in thickness necessary to accommodate contents, sized to receive 8-1/2 by 11 inch paper. Provide clear plastic sleeve on spine to hold labels describing contents. Provide pockets in covers to receive folded sheets.

a. Where 2 or more binders are necessary to accommodate data, correlate data in each binder into related groupings according to Project Manual table of contents. Cross-reference other binders where necessary to provide essential information for proper operation or maintenance of piece of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter covered. Identify subject matter by specification title and specification section number. Indicate volume number for multiple volume sets of manuals.

2. Dividers: Provide heavy paper dividers with celluloid-covered tabs for each separate Section. Mark each tab to indicate contents. Provide typed description of product and major parts of equipment included in Section on each divider.

3. Protective Plastic Jackets: Provide protective, transparent, plastic jackets designed to enclose diagnostic software for computerized electronic equipment, if any.

4. Text Material: Where maintenance manuals require written material, use manufacturer's standard printed material. If manufacturer's standard printed material is not available, provide specially prepared data, neatly typewritten, on 8-1/2 by 11 inch, 20 lb/sq. ft. white bond paper.

5. Drawings: Where maintenance manuals require drawings or diagrams, provide reinforced, punched binder tabs on drawings and bind in with text.

a. Where oversize drawings are necessary, fold drawings to same size as text pages

and use as foldout.

b. If drawings are too large to be used practically as foldout, place drawing, neatly folded, in front or rear pocket of binder. Insert typewritten page indicating drawing title, description of contents, and drawing location at appropriate location in manual.

1.6 MANUAL CONTENT

A. In each manual include information specified in individual Specification Section and following information, as applicable to Project, for each major component of building equipment and its controls:

1. General system or equipment description.
2. Design factors and assumptions.
3. Copies of applicable Shop Drawings and Product Data.
4. System or equipment identification, including:
    a. Name of manufacturer.
    b. Model number.
    c. Serial number of each component.
5. Operating instructions.
6. Emergency instructions.
7. Wiring diagrams.
8. Inspection and test procedures.
9. Maintenance procedures and schedules.
10. Precautions against improper use and maintenance.
11. Copies of warranties
12. Repair instructions including spare parts listing.
13. Sources of required maintenance materials and related services.
14. Manual index.

B. Organize each manual into separate Sections for each piece of related equipment. As a minimum, each manual shall contain title page; table of contents; copies of Product Data, supplemented by Drawings and written text; and copies of each warranty, bond, and service

contract issued.

1. Title Page: Provide title page in transparent, plastic envelope as first sheet of each manual. Provide following information:

   a. Subject matter covered by manual.

   b. Name and address of Project.

   c. Date of submittal.

   d. Name, address, and telephone number of Contractor.

   e. Name and address of Engineer/Architect.

   f. Cross-reference to related systems in other operation and maintenance manuals.

2. Table of Contents: After title page, include typewritten table of contents for each volume, arranged systematically according to Project Manual format. Include list of each product included, identified by product name or other appropriate identifying symbol and indexed to content of volume.

   a. Where system requires more than one volume to accommodate data, provide comprehensive table of contents for all volumes in each volume of set.

3. General Information: Provide general information section immediately following table of contents, listing each product included in manual, identified by product name. Under each product, list name, address, and telephone number of subcontractor or Installer and maintenance contractor. Clearly delineate extent of responsibility of each entity. Include local source for replacement parts and equipment.

4. Product Data: Where manuals include manufacturer's standard printed data, include only sheets that are pertinent to part or product installed. Mark each sheet to identify each part or product included in installation. Where Project includes more than one item in tabular format, identify each item, using appropriate references from Contract Documents. Identify data that is applicable to installation, and delete references to information that is not applicable.

5. Written Text: Prepare written text to provide necessary information where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems. Prepare written text where it is necessary to provide additional information or to supplement data included in manual. Organize text in consistent format under separate headings for different procedures. Where necessary, provide logical sequence of instruction for each operation or maintenance procedure.

6. Drawings: Provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate relationship of component parts of equipment or systems or to provide control or flow diagrams. Coordinate these drawings with information contained in project record drawings specified in Section 01 78 39 to assure correct illustration of completed installation.

a. Do not use original project record documents as part of operation and maintenance manuals.

7. Warranties, Bonds, and Service Contracts: Provide copy of each warranty, bond, or service contract in appropriate manual for information of Owner's operating personnel. Provide written data outlining procedures to follow in event of product failure. List circumstances and conditions that would affect validity of warranty or bond.

1.7 MATERIAL AND FINISHES MAINTENANCE MANUAL

A. Submit 4 copies of each manual, in final form, on material and finishes to Construction Manager for distribution. Provide one section for architectural products, including applied materials and finishes. Provide second section for products designed for moisture protection and products exposed to weather.

1. Refer to individual Specification Sections for additional requirements on care and maintenance of materials and finishes.

B. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes.

1. Manufacturer's Data: Provide complete information on architectural products, including following, as applicable:

a. Manufacturer's catalog number.

b. Size.

c. Material composition.

d. Color.

e. Texture.

f. Reordering information for specially manufactured products.

2. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information on cleaning agents and methods that could prove detrimental to product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture Protection and Products Exposed to Weather: Provide complete manufacturer's data with instructions on inspection, maintenance, and repair of products exposed to weather or designed for moisture-protection purposes.

1. Manufacturer's Data: Provide manufacturer's data giving detailed information, including following, as applicable:

a. Applicable standards.

b. Chemical composition.

c. Installation details.

d. Inspection procedures.

e. Maintenance information.

f. Repair procedures.

1.8 EQUIPMENT AND SYSTEMS MAINTENANCE MANUAL

A. Submit 6 copies of each manual, in final form, on equipment and systems to Construction Manager for distribution. Provide separate manuals for each unit of equipment, each operating system, and each electric and electronic system.

1. Refer to individual Specification Sections for additional requirements on operation and maintenance of various pieces of equipment and operating systems.

B. Equipment and Systems: Provide following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide complete description of each unit and related component parts, including following, as applicable to Project:

a. Equipment or system function.

b. Operating characteristics.

c. Limiting conditions.

d. Performance curves.

e. Engineering data and tests.

f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of component part or piece of equipment, provide following:

a. Printed operation and maintenance instructions.

b. Assembly drawings and diagrams required for maintenance.

c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including following:

a. Routine operations.

b. Troubleshooting guide.

c. Disassembly, repair, and reassembly.

d. Alignment, adjusting, and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including following:

a. Startup procedures.

b. Equipment or system break-in.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Instructions on stopping.

f. Shutdown and emergency instructions.

g. Summer and winter operating instructions.

h. Required sequences for electric or electronic systems.

i. Special operating instructions.

5. Servicing Schedule: Provide schedule of routine servicing and lubrication requirements, including list of required lubricants for equipment with moving parts.

6. Controls: Provide description of sequence of operation and as-installed control diagrams by control manufacturer for systems requiring controls.

7. Coordination Drawings: Provide each Contractor's Coordination Drawings.

a. Provide as-installed, color-coded, piping diagrams, where required for identification.

8. Valve Tags: Provide 6 copies of 6mil laminated charts of valve-tag numbers, with location and function of each valve.

9. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panelboards, including following:

a. Electric service.

b. Controls.

c. Communication.

1.9 INSTRUCTIONS FOR OWNER'S PERSONNEL

A. Prior to final inspection, instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Provide instruction at mutually agreed upon times.

1. For equipment that requires seasonal operation, provide similar instruction during other seasons.

2. Use operation and maintenance manuals for each piece of equipment or system as basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

B. Training: When required by other sections, conduct training as follows:

1. Schedule training to conform to personnel availability at facility and to conclude prior to start up of system. Base duration of training on complexity of system or equipment. Training shall be done by qualified instructors from manufacturer.

2. When required by other sections, prepare video tapes to assist maintenance personnel in trouble-shooting systems and making routine repairs. Make video tapes at Project site to ensure video portrayal is representative of true system.

a. As part of training, devote one lesson plan to reviewing of video to allow new employees to view tape at their own convenience and be able to comprehend system without need for instructor in attendance.

3. In addition to written technical descriptions, training shall detail training program to allow those who have completed training to provide training for new employees resulting in a self-perpetuating training program.

PART 2 PRODUCTS (Not Applicable)

PART 3 EXECUTION (Not Applicable)

END OF SECTION

SECTION 01 78 36 - WARRANTIES

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Administrative and procedural requirements for warranties required by Contract Documents, including manufacturers standard warranties on products and special warranties.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including Supplementary Conditions.

1.3 RELATED SECTIONS

A. Other Division 1 Specification Sections including, but not limited to, following:

1. Section 01 77 00 Closeout Procedures.

2. Section 01 78 23 Operation and Maintenance Data.

B. Divisions 2 through 34 Sections:

1. Specific requirements for warranties on products and installations specified to be warranted.

2. Certifications and other commitments and agreements for continuing services to Owner.

1.4 DEFINITIONS

1. Standard product warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by manufacturer to Owner.

2. Special warranties are written warranties required by or incorporated in Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for Owner.

1.5 WARRANTY REQUIREMENTS

A. Provide standard warranties and other certifications required by Construction Manager as indicated in Construction Conditions.

B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Construction Manager. Warranty start shall be the date of Substantial Completion, not the date of submittal approval manufacture, shipment, delivery, installation or purchase.

C. Related Damages and Losses: When correcting failed or damaged warranted

construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.

D. Reinstatement of Warranty: When Work covered by warranty has failed and been corrected by replacement or rebuilding, reinstate warranty shall be equal to the balance of warranty for equitable adjustment for depreciation by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.

E. Replacement Cost: Upon determination that Work covered by warranty has failed, replace or rebuild Work to acceptable condition complying with requirements of Contract Documents. Construction Manager is responsible for cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of Work through portion of its anticipated useful service life.

F. Owner's Recourse:

1. Expressed warranties made to Owner are in addition to implied warranties and shall not limit duties, obligations, rights, and remedies otherwise available under law. Expressed warranty periods shall not be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.

2. Expressed warranties made to Owner shall not deprive Owner of other rights Owner may have under other provisions of Contract Documents and are in addition to and run concurrent with other warranties made by Construction Manager under requirements of Contract Documents.

3. Rejection of Warranties: Owner reserves right to reject warranties and to limit selection to products with warranties not in conflict with requirements of Contract Documents.

G. Where Contract Documents require special warranty, or similar commitment on Work or part of Work, Owner reserves right to refuse to accept Work, until Construction Manager presents written evidence that entities required to countersign such commitments have done so or are willing to do so.

1.6 SUBMITTALS

A. Submit written warranties to Construction Manager prior to date certified for Substantial Completion. If Certificate of Substantial Completion designates commencement date for warranties other than date of Substantial Completion for Work, or designated portion of Work, submit written warranties upon request of Construction Manager.

1. When a designated portion of Work is completed and occupied or used by Owner, by separate agreement with Construction Manager during construction period, submit properly executed warranties to Construction Manager within 15 days of completion of that designated portion of Work.

B. When Contract Documents require Construction Manager, or Construction Manager and subcontractor, supplier or manufacturer to execute special warranty, prepare written document that contains appropriate terms and identification, ready for execution by required parties. Submit draft to Owner and Engineer/Architect, through Construction Manager for approval prior to final execution.

1. Refer to other sections for specific content requirements and particular requirements for submitting special warranties.

C. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by Construction Manager, subcontractor, supplier, or manufacturer. Organize warranty documents into orderly sequence based on table of contents of Project Manual.

D. Bind warranties in heavy-duty, commercial-quality, durable 3-ring, vinyl-covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11 inch paper.

1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product, and name, address, and telephone number of Installer.

2. Identify each binder on front and spine with typed or printed title "WARRANTIES," Project title or name, and name of Construction Manager.

3. When warranted construction requires operation and maintenance manuals specified in Section 01 78 36, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

(Not Applicable)

END OF SECTION

SECTION 01 78 39 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections:

1. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
2. Divisions 02 through 49 Sections for specific requirements for project record documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal: Submit one paper copy set of marked-up record prints and one set(s) of plots from corrected record digital data files. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
b. Final Submittal: Submit one paper copy set of marked-up record prints, one set(s) of record digital data files, and three set(s) of record digital data file plots. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy and one annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Record data as soon as possible after obtaining it.
c. Record and check the markup before enclosing concealed installations.

2. Mark the Contract Drawings and Shop Drawings completely and accurately. Utilize personnel proficient at recording graphic information in production of marked-up record prints.
3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Construction Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Format: DWG, Version , operating in Microsoft Windows operating system.
3. Format: Annotated PDF electronic file with comment function enabled.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect through Construction Manager for resolution.
6. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect and Construction Manager.
e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked up paper copy of Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked up miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and modifications to project record documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 01 78 39

SECTION 01 80 00 - COMMISSIONING

PART 1 - GENERAL

1.1 DESCRIPTION

Commissioning: Commissioning is a systematic process of ensuring that all building systems perform interactively according to the Owner's Project Requirements and the owner's operational needs. This project has a goal of achieving a LEED silver rating and has implemented the commissioning program to meet the specific requirements of the Fundamental Commissioning Prerequisite.

A. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing and performance testing.

Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

LEED Fundamental Commissioning Prerequisite Objectives

- Verify the Owner's Requirements for commissioned systems are clear and complete by reviewing the Owner's Project Requirements document.
- Verify design of commissioned systems meet requirements of the Owner by cross-referencing the designer's Basis of Design with the Owner's Project Requirements.
- Establish a plan for the commissioning program that is agreed upon by all parties through the review and acceptance of this Commissioning Plan document.
- Incorporate the requirements of the commissioning program into the contract documents through production of the Commissioning Specification section 01800.
- Verify commissioned equipment/ systems are installed properly and receive adequate checkout through site observation and pre-functional checkouts.
- Verify and document commissioned equipment/ systems are performing per the Owner's Project Requirements and the designer's Basis of Design through witnessing and documentation of system functional tests.
- Provide a summary report on the commissioning program as implemented.

B. The commissioning process does not take away from or reduce the responsibility of the system designers or installing contractors to provide a finished and fully functioning product.

C. Abbreviations. The following are common abbreviations used in the Specifications and in the Commissioning Plan. Definitions are found in Section 1.6.

A/E -	Architect and Design Engineers	DDC -	Direct Digital Control System
BAS -	Building Automation System	EC -	Electrical Contractor
CxA -	Commissioning Authority	MC -	Mechanical Contractor
CC -	Controls Contractor	PFC -	Prefunctional Checklist
CM -	Construction Manager (the owner's representative)	FPT -	Functional Performance Test
Cx -	Commissioning	Subs -	Subcontractors to General
Cx Plan -	Commissioning Plan	TAB -	Test and Balance Contractor

1.2 COORDINATION

A. Commissioning Team. The members of the commissioning team consist of the Commissioning authority (CxA), the Construction Management firm (CM), the architect and design engineers (particularly the mechanical engineer), the Mechanical Contractor (MC), the Electrical Contractor (EC), the TAB representative, the Controls Contractor (CC), any other installing subcontractors or suppliers of equipment. If available, the Owner's building or plant operator/engineer is also a member of the commissioning team.

B. Management. The CxA is hired by the CM directly. The CxA directs and coordinates the commissioning activities and the reports to the CM. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents. The CxA's responsibilities are the same regardless of who hired the CxA.

C. Scheduling. The CxA will work with the CM according to established protocols to schedule the commissioning activities. The CxA will provide sufficient notice to the CM for scheduling commissioning activities. The CM will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

The CxA will provide the initial schedule of primary commissioning events at the commissioning scoping meeting. The Commissioning Plan provides a format for this schedule. As construction progresses more detailed schedules are developed by the CxA.

1.3 COMMISSIONING PROCESS

A. Commissioning Plan. The commissioning plan provides guidance in the execution of the commissioning process. Just after the initial commissioning scoping meeting the CxA will finalize the plan which is then considered the "final" plan.

B. Commissioning Process. The following narrative provides a brief overview of the typical commissioning tasks during construction and the general order in which they occur.

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.

2. Additional meetings will be required throughout construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve problems.

3. Equipment documentation is submitted to the CxA during the normal submittals process, including detailed start-up procedures.

4. The CxA reviews start-up plans developed by the Subs and vendors, and provide the Subs with prefunctional checklists (PFC) to be completed, prior to the startup process.

5. In general, the checkout and performance verification proceeds from simple to complex levels; with PFCs being completed before functional testing.

6. The Subs, under their own direction, execute and document the PFCs. The CxA documents that the checklists were completed according to the commissioning plan.

7. The CxA develops specific equipment and system functional performance test (FPT) procedures. The Subs review the procedures.

8. The FPT procedures are executed by the Subs, under the direction of, and documented by the CxA.

9. Items of non-compliance in material, installation or setup are corrected at the Sub's expense and the system retested.

10. Commissioning (with the exception of any seasonal or deferred testing) is completed before Substantial Completion.

11. Seasonal and/or deferred testing is conducted, as specified or required.

1.4 UNIT PRICES

A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 01 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing.

1.5 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section.

B. All Parties
1. Follow the Commissioning Plan.

2. Attend commissioning scoping meeting and additional meetings, as necessary.

C. Architect (of A/E)
The responsibilities of the Architect, during construction and acceptance phases in addition to those listed in (B) are:

Construction and Acceptance Phase
1. Review and comment on Commissioning Plan.

2. Coordinate resolution of system deficiencies identified during commissioning and envelope review processes, according to the contract documents.

3. Prepare and submit final as-built Owner's Project Requirements documentation for inclusion in the O&M manuals.

Warranty Period
1. Coordinate resolution of design non-conformance and design deficiencies identified during seasonal testing.

D. Mechanical and Electrical Designers/Engineers (of the A/E)
The responsibilities of the Designers, during construction and acceptance phases in addition to those listed in (B) are:

Construction and Acceptance Phase
1. Review and comment on Commissioning Plan.

2. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.

4. Participate in the resolution of system deficiencies identified during commissioning, according to the contract documents.

5. Prepare and submit the final as-built Basis of Design and operating parameters documentation for inclusion in the O&M manuals.

6. Review the PFCs for major pieces of equipment for sufficiency prior to their use.

7. Review the FPT procedure forms for major pieces of equipment for sufficiency prior to their use.

Warranty Period

1. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning during seasonal testing.

E. Commissioning Authority (CxA)

The CxA is not responsible for design concept, design criteria, compliance with codes, design or general construction scheduling, cost estimating, or construction management. The CxA may assist with problem-solving non-conformance or deficiencies, but ultimately that responsibility resides with the CM and the A/E. The primary role of the CxA is to develop and coordinate the execution of a testing plan, observe and document performance—that systems are functioning in accordance with the documented Owner's Project Requirements and in accordance with the Contract Documents. The Contractors will provide all tools or the use of tools to start, check-out and functionally test equipment and systems.

Construction and Acceptance Phase

1. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties.

2. Coordinate the commissioning work with the CM, to ensure that commissioning activities are being scheduled into the master schedule.

3. Revise, as necessary, the Commissioning Plan.

4. Request and review additional information required to perform commissioning tasks, including O&M materials, contractor start-up and checkout procedures.

5. Before startup, gather and review the current control sequences and interlocks and work with contractors and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.

6. Review normal Contractor submittals applicable to systems being commissioned for compliance with commissioning needs, concurrent with the A/E reviews.

7. Write and distribute PFCs.

8. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress.

9. Approve PFC completion by reviewing and by selected site observation and spot checking.

10. Verify systems startup by reviewing start-up reports and by selected site observation.

11. Review TAB execution plan.

12. Review completed air and water systems balancing reports.

13. With necessary assistance and review from installing contractors, write the FPT procedures for equipment and systems.

14. Coordinate, witness and approve FPTs performed by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved.

15. Maintain a master deficiency and resolution log and a separate testing record. Provide the CM with written progress reports and test results with recommended actions.

16. Compile and maintain commissioning record documents.

17. Provide a final commissioning report (as described in this section).

Warranty Period

1. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

H. Construction Manager—(CM)

The responsibilities of the CM, during construction and acceptance phases in addition to those listed in (B) are:

Construction and Acceptance Phase

1. Facilitate the coordination of the commissioning work by the CxA and ensure that commissioning activities are being scheduled into the master schedule.

2. Furnish a copy of all construction documents, addenda, change orders and approved submittals and shop drawings related to commissioned equipment to the CxA.

3. In each purchase order or subcontract written, include requirements for submittal data, O&M data, commissioning tasks.

4. Ensure that all Subs execute their commissioning responsibilities according to the Contract Documents and schedule.

5. A representative shall attend a commissioning scoping meeting and other necessary meetings scheduled by the CxA to facilitate the Cx process.

Warranty Period

1. Ensure that Subs execute seasonal or deferred FPTs, witnessed by the CxA, according to the specifications.

2. Ensure that Subs correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

I. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.

2. Assist in equipment testing per agreements with Subs.

3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the Contractor.

4. Through the contractors they supply products to, analyze specified products and verify that the designer has specified the newest most updated equipment reasonable for this project's scope and budget.

5. Provide information requested by CxA regarding equipment sequence of operation and testing procedures.

6. Review test procedures for equipment installed by factory representatives.

J. Mechanical, Electrical, Plumbing, Controls and TAB Contractors. The commissioning responsibilities applicable to each of the plumbing contractors of Division 22, Mechanical, Controls and TAB contractors of Division 23 and Electrical Contractors of Division 26, in addition to those listed in (B) are as follows (all references apply to commissioned equipment only):

Construction and Acceptance Phases

1. Include and itemize the cost of commissioning in the contract price.

2. In each purchase order or subcontract written, include requirements for submittal data, commissioning documentation, O&M data and training.

3. Contractors shall provide the CxA with normal cut sheets and shop drawing submittals of commissioned equipment.

4. Provide additional requested documentation, prior to normal O&M manual submittals, to the CxA for development of functional testing procedures.

6. Develop a full start-up and initial checkout plan using manufacturer's start-up procedures for all commissioned equipment. Submit to CxA for review prior to startup.

7. During initial checkout process, and prior to startup procedures, execute the PFCs for all commissioned equipment as applicable and submit to CxA for review and approval.

8. Perform and clearly document all completed startup and system operational checkout procedures, providing a copy to the CxA.

9. Address current A/E punch list items that may affect system functional operation or performance before functional testing. Air and water TAB shall be completed with discrepancies and problems remedied before functional testing of the respective air- or water-related systems.

10. Provide skilled technicians to execute the FPTs under the direction of the CxA for specified equipment in this section. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.

11. Correct deficiencies (differences between specified and observed performance) as interpreted by the CxA, CM and A/E and retest the equipment.

Warranty Period

1. Execute seasonal or deferred FPTs, witnessed by the CxA, according to the specifications.

2. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

K. Mechanical Contractor. The responsibilities of the HVAC mechanical contractor, during construction and acceptance phases in addition to those listed in (B & I) are:

1. Provide startup for all HVAC equipment, except for the building automation control system.

2. Assist and cooperate with the TAB contractor and CxA by:

   a. Putting all HVAC equipment and systems into operation and continuing the operation during each working day of TAB and commissioning, as required.

   b. Including cost of sheaves and belts that may be required by TAB.

   c. Providing test holes in ducts and plenums where directed by TAB to allow air measurements and air balancing. Providing an approved plug.

   d. Providing temperature and pressure taps according to the Construction Documents for TAB and commissioning testing.

3. List and clearly identify on the as-built drawings the locations of all air-flow stations.

4. Prepare a preliminary schedule for Division 23 pipe and duct system testing, flushing and cleaning, equipment start-up and TAB start and completion for use by the CxA. Update the schedule as appropriate.

5. Notify the CM depending on protocol, when pipe and duct system testing, flushing, cleaning, startup of each piece of equipment and TAB will occur. Be responsible to notify the CM, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process.

L. Controls Contractor. The commissioning responsibilities of the controls contractor, during construction and acceptance phases in addition to those listed in (B & I) are:

1. Sequences of Operation Submittals. The Controls Contractor's submittals of control drawings shall include complete detailed sequences of operation for each piece of equipment, regardless of the completeness and clarity of the sequences in the specifications.

2. Assist and cooperate with the TAB contractor in the following manner:

   a. Meet with the TAB contractor prior to beginning TAB and review the TAB plan to determine the capabilities of the control system toward completing TAB. Provide the TAB any needed unique instruments for setting terminal unit boxes and instruct TAB in their use (handheld control system interface for use around the building during TAB, etc.).

   b. For a given area, have all required PFCs, calibrations, startup and selected functional tests of the system completed and approved by the CxA prior to TAB.

   c. Provide a qualified technician to operate the controls to assist the TAB contractor in performing TAB, or provide sufficient training for TAB to operate the system without assistance.

3. Assist and cooperate with the CxA in the following manner:

   a. Using a skilled technician who is familiar with this building, execute the FPTs of the controls system as specified. Assist in the FPTs of all equipment included in the commissioning scope.

b. Execute all control system trend logs as specified.

4. Provide a signed and dated certification to the CxA and CM upon completion of the checkout of each controlled device, equipment and system prior to FPTs for each piece of equipment or system, that all system programming is complete as to all respects of the Contract Documents, except FPT requirements.

5. List and clearly identify on the as-built duct and piping drawings the locations of all static and differential pressure sensors (air, water and building pressure).

M. TAB Contractor. The duties of the TAB contractor, in addition to those listed in (B & I) are:

1. Six weeks prior to starting TAB, submit to the CM the qualifications of the site technician for the project, including the name of the contractors and facility managers of recent projects the technician on which was lead. The Owner will approve the site technician's qualifications for this project.

2. Submit the outline of the TAB plan and approach for each system and component to the CxA, CM and the controls contractor six weeks prior to starting the TAB. This plan will be developed after the TAB has some familiarity with the control system.

3. The submitted plan will include, but not be limited to, the following:

a. An explanation of the intended use of the building control system. The controls contractor will comment on feasibility of the plan.

b. All field checkout sheets and logs to be used that list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.

c. Detailed step-by-step procedures for TAB work for each system and issue. For example: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, diversity issues, expected problems and solutions, etc. Criteria for using air flow straighteners or relocating flow stations and sensors will be discussed. Provide the analogous explanations for the water side.

d. The identification and types of measurement instruments to be used and their most recent calibration date.

e. Details of TAB work to be done in phases (by floor), or areas to be built out later.

f. Details regarding specified deferred or seasonal TAB work.

g. Details of any specified false loading of systems to complete TAB work.

h. Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency).

i. Plan for formal progress reports (scope and frequency).

j. Plan for formal deficiency reports (scope, frequency and distribution).

4. A running log of events and issues shall be kept by the TAB field technicians. Submit hand-written reports of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests to CxA and CM at least twice a week.

5. Communicate in writing to the controls contractor all set point and parameter changes made or problems and discrepancies identified during TAB which affect the control system setup and operation.

6. Provide a draft TAB report within two weeks of completion. A copy will be provided to the CxA. The report will contain a full explanation of the methodology, assumptions and the results in a clear format with designations of all uncommon abbreviations and column headings. The report should follow the latest and most rigorous reporting recommendations per the specified recommended agencies (e.g. AABC, NEBB, etc.)

7. Provide a final TAB report for the CxA with details, as in the draft.

N. Electrical Contractors. The commissioning responsibilities applicable to the electrical contractor in addition to those listed in (B & I) are: *(all references apply to commissioned equipment only)*:

1. Provide startup for all electrical equipment, except for the building automation control system.

2. Assist and cooperate with the CxA by:

a. Putting all electrical equipment and systems into operation and continuing the operation during each working day of commissioning, as required.

3. Prepare a preliminary schedule for Division 26 equipment and system testing, equipment start-up completion for use by the CxA. Update the schedule as appropriate.

4. Notify the CM or CxA depending on protocol, when equipment and system testing and startup of each piece of equipment will occur. Be responsible to notify the CM or CxA, ahead of time, when commissioning activities not yet performed or not yet scheduled will delay construction. Be proactive in seeing that commissioning processes are executed and that the CxA has the scheduling information needed to efficiently execute the commissioning process.

O. LEED Consultant (LC) The commissioning responsibilities applicable to the LEED consultant in addition to those listed in (B) are: *(all references apply to commissioned equipment only)*:

1. Responsible for managing LEED program including tracking and submission of commissioning documentation for LEED certification.

2. Provide guidance to commissioning team regarding Fundamental Commissioning Prerequisite.

1.6 DEFINITIONS

Acceptance Phase - phase of construction after startup and initial checkout when FPTs, O&M documentation review and training occurs.

Basis of Design - The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the Owner's Project Requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the intent. Some reiterating of the Owner's Project Requirements may be included.

Commissioning Authority (CxA) - an independent agent, not otherwise associated with the A/E team members or the Contractor, though he/she may be hired as a subcontractor to them. The CxA directs and coordinates the day-to-day commissioning activities. The CxA does not take an oversight role like the CM. The CxA is part of the CM team and shall report directly to the CM.

Commissioning Plan - an overall plan, developed before or after bidding, that provides the structure, schedule and coordination planning for the commissioning process.

Datalogging - monitoring flows, currents, status, pressures, etc. of equipment using stand-alone dataloggers separate from the control system.

Deferred Functional Tests - FPTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that disallow the test from being performed.

Deficiency - a condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the Owner's Project Requirements).

Design Narrative or Design Documentation - sections of either the Owner's Project Requirements or Basis of Design.

Functional Performance Test (FPT) - test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional performance testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure set point). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. Traditional air or water test and balancing (TAB) is not functional performance testing, in the commissioning sense of the word. TAB's primary work is setting up the system flows and pressures as specified, while functional performance testing is verifying that which has already been set up. The commissioning authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is usually performed by the installing contractor or vendor. FPTs are performed after prefunctional checklists and startups are complete.

Indirect Indicators - indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100% closed.

Monitoring - the recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

Non-Compliance - see Deficiency.

Non-Conformance - see Deficiency.

Owner-Contracted Tests - tests paid for by the Owner outside the CM's contract and for which the CA does not oversee. These tests will not be repeated during functional tests if properly documented.

Owner's Project Requirements - a dynamic document that provides the explanation of the ideas, concepts and criteria that are considered to be very important to the owner. It is initially the outcome of the programming and conceptual design phases.

Prefunctional Checklist (PFC) - a list of items to inspect and elementary component tests to conduct to verify proper installation of equipment, provided by the CxA to the Sub. Prefunctional checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). However, some prefunctional checklist items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before FPTs. PFCs augment and are combined with the manufacturer's start-up checklist. Even without a commissioning process, contractors typically perform some, if not many, of the prefunctional checklist items a commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. Therefore, for most equipment, the contractors execute the checklists on their own. The commissioning authority only requires that the procedures be documented in writing, and does not witness much of the prefunctional checklisting, except for larger or more critical pieces of equipment.

Seasonal Performance Tests - FPT that are deferred until the system(s) will experience conditions closer to their design conditions.

Test Procedures - the step-by-step process which must be executed to fulfill the test requirements. The test procedures are developed by the CxA.

Test Requirements - requirements specifying what modes and functions, etc. shall be tested. The test requirements are not the detailed test procedures. The test requirements are specified in the Contract Documents.

Trending - monitoring using the building control system.

Warranty Period - warranty period for entire project, including equipment components. Warranty begins at Substantial Completion and extends for at least one year, unless specifically noted otherwise in the Contract Documents and accepted submittals.

1.7 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. See table below for equipment sampling strategy.

Equipment	Sampling Percentage
HVAC SYSTEMS	
Boilers	100%
Chillers	100%
Cooling Towers	100%
Pumps - Hot Water System	100%
Pumps - Chilled Water System	100%
Pumps - Condenser Water System	100%
Pumps - Fuel Oil	100%
Air handing Units	100%
Equipment	Sampling Percentage
Fans (Supply/Space Pressurization/Make Up)	25%
Exhaust Fans	25%
In-Line Return Fans	100%
Fan Coil Units	100%
Variable Air Volume Boxes	25%
Cabinet Unit Heaters/ Unit Heaters	10%
Finned Tube/Convector/Radiant Flooring	10%
ELECTRICAL SYSTEMS	
Variable Frequency Drives	100%
Lighting Systems	10%
Lighting Control Systems (by Room)	10%
PLUMBING SYSTEMS	
Domestic Water Heaters	100%
Domestic Water Pumps	100%

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required FPTs shall be provided by the Division contractor for the equipment being tested. For example, the mechanical contractor of Division 23 shall ultimately be responsible for all standard testing equipment for the HVAC&R system and controls system in Division 23, except for equipment specific to and used by TAB in their commissioning responsibilities. Two-way radios shall be provided by the Division Controller.

B. Special equipment, tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents shall be included in the base bid price to the Contractor and left on site.

C. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the *Specifications.* If not otherwise noted, the following minimum requirements apply: Temperature sensors and digital thermometers shall have a certified calibration within the past year to an accuracy of 0.5°F and a resolution of + or - 0.1°F. Pressure sensors shall have an accuracy of + or - 2.0% of the value range being measured (not full range of meter) and have been calibrated within the last year. All equipment shall be calibrated according to the manufacturer's recommended intervals and when dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 - EXECUTION

3.1 MEETINGS

A. Scoping Meeting. Within 90 days of commencement of construction, the CxA will schedule, plan and conduct a commissioning scoping meeting with the entire commissioning team in attendance. This meeting will also outline the building envelope review program. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan to its "final" version, which will also be distributed to all parties.

B. Miscellaneous Meetings. Other meetings will be planned and conducted by the CxA as construction progresses. These meetings will cover coordination, deficiency resolution and planning issues with particular Subs. The CxA will plan these meetings and will minimize unnecessary time being spent by Subs. The commissioning meetings may be held monthly, until the testing phase begins, when they may be held as frequently as once per week.

3.2 REPORTING

A. The CxA will provide regular monthly reports to the CM, with increasing frequency as required as the testing phase of commissioning progresses. Standard format of this report is provided and referenced in the *Commissioning Plan.*

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised of commissioning progress and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report by the CxA will be provided to the CM, focusing on evaluating commissioning process issues and identifying areas where the process could be improved. All acquired documentation, logs, minutes, reports, deficiency lists, communications, findings, unresolved issues, etc., will be

compiled in appendices and provided with the summary report. PFCs, FPTs and monitoring reports will not be part of the final report, but will be stored in the commissioning manuals.

3.3 PREFUNCTIONAL CHECKLISTS, START-UP AND INITIAL CHECKOUT

A. The following procedures apply to all equipment to be commissioned, according to Section 1.6, Systems to be Commissioned. Total equipment counts can be found in the Commissioning Plan.

B. General. PFCs are important to ensure that the equipment and systems are hooked up and operational. It ensures that FPTs (in-depth system checkout) may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout. No sampling strategies are used. The prefunctional testing for a given system must be successfully completed prior to formal FPTs of equipment or subsystems of the given system. See the sample checklists provided at the end of this section.

C. Prefunctional Checkout and Start-Up Plan.

1. The CxA creates the PFCs which ensure the correct component is in place and also evaluates a minimal number of points to verify that the components has been installed correctly and per the contract documents. These installation checkouts are to be executed prior to startup of the systems.

2. These checklists and tests are provided by the CxA to the CM. The CM determines which trade is responsible for executing and documenting each of the line item tasks and notes that trade on the form. Each form may have more than one trade responsible for its execution.

3. The subcontractor responsible for the purchase of the equipment develops the full start-up plan by combining the CxA's checklists with (and/or adding to) the manufacturer's detailed start-up and checkout procedures from the O&M manual and the normally used field checkout sheets. The plan will include checklists and procedures with specific boxes or lines for recording and documenting the checking and inspections of each procedure and a summary statement with a signature block at the end of the plan.

   The following is an example of the minimum requirements for a full start-up plan:

   a. Static checklist items from the CxA's PFCs.

   b. The manufacturer's standard written start-up procedures copied from the installation manuals with check boxes by each procedure and a signature block added by hand.

   c. The manufacturer's normally used field checkout sheets.

4. The subcontractor submits the full startup plan to the CxA for review.

5. The CA reviews the procedures and the format for documentation.

D. Execution of Prefunctional Checklists and Startup.

Prefunctional Checkout:

1. Prior to startup, the execution of the PFCs are directed and executed by the Sub or vendor. When checking off PFCs, signatures may be required of other Subs for verification of completion of their work.

2. The CxA shall audit, at minimum, the checkouts for each piece of primary equipment, unless there are multiple units, (in which case a sampling strategy may be used as approved by the CM). See table in section 1.7 paragraph A for sampling rates

3. Only individuals that have direct knowledge of the piece of equipment for which the prefunctional checklist is being filled shall initial or check off items on that sheet. It is not acceptable for witnessing supervisors to fill out these forms.

Startup:

4. At a minimum of two weeks prior to startup, the Subs and vendors schedule startup and checkout with the CM and CxA. The performance of startup is directed and executed by the Sub or vendor. When checking off the startup checklists, signatures may be required of other Subs for verification of completion of their work.

5. The Subs and vendors shall execute startup and provide the CxA with a signed and dated copy of the completed start-up procedures.

6. Only individuals that have direct knowledge and witnessed that a line item task on the startup checklist was actually performed shall initial or check that item off. It is not acceptable for witnessing supervisors to fill out these forms.

E. Deficiencies, Non-Conformance and Approval in Checklists and Startup.

1. The Subs shall clearly list any outstanding items of the initial prefunctional checkouts and start-up procedures that were not completed successfully, at the bottom of the procedures form or on an attached sheet. The procedures form and any outstanding deficiencies are provided to the CxA within two days of test completion.

2. The CxA reviews the report and submits either a non-compliance report or an approval form to the Sub or CM. The CxA shall work with the Subs and vendors to correct and retest deficiencies or uncompleted items. The CxA will involve the CM and others as necessary. The installing Subs or vendors shall correct all areas that are deficient or incomplete in the checklists and tests in a timely manner, and shall notify the CxA as soon as outstanding items have been corrected and resubmit an updated start-up report. When satisfactorily completed, the CxA recommends approval of the execution of the checklists and startup of each system to the CM.

3. Items left incomplete, which later cause deficiencies or delays during functional testing may result in back charges to the responsible party.

3.4 FUNCTIONAL PERFORMANCE TESTING

A. This sub-section applies to all commissioning functional performance testing.

B. The general list of equipment to be commissioned is found in Part 1.6. Total equipment counts and sampling rates can be found in the Commissioning Plan.

C. Objectives and Scope. The objective of FPTs are to demonstrate that each system is operating according to the documented Owner's Project Requirements and Contract Documents. FPTs facilitate bringing systems from a state of substantial completion to full dynamic operation. Additionally, during the testing process, areas of deficient performance are identified and corrected, improving the operation of the systems.

In general, each system should be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load) where there is a specified system response. Verifying each sequence in the sequences of operation is required. Proper responses to such modes and conditions as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc. shall also be tested. See the sample functional test provided at the end of this section.

D. Development of Test Procedures. The CxA shall develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each Sub or vendor responsible to execute a test shall provide limited assistance to the CxA in developing the procedures review (answering questions about equipment, operation, sequences, etc.). Prior to execution, the CxA shall provide a copy of the test procedures to the Sub(s) who shall review the tests for feasibility, safety, equipment and warranty protection. The CxA may submit the tests to the A/E for review, if requested. Representative test formats and examples (not designed for this facility) are found at the end of this section.

E. Coordination and Scheduling. The Subs shall provide sufficient notice to the CxA regarding their completion schedule for the PFCs and startup of all equipment and systems. The CxA will schedule FPTs through the CM and affected Subs. The CxA shall direct, witness and document the FPTs of all equipment and systems. The Subs shall execute the tests.

In general, FPTs are conducted after prefunctional testing and startup has been satisfactorily completed. The control system is sufficiently tested and approved before it is used for TAB or to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before FPTs of air-related or water-related equipment or systems.

F. Problem Solving. The CxA will recommend solutions to problems found, however the burden of responsibility to solve, correct and retest problems is with the CM, Subs and A/E.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation. The CxA shall witness and document the results of all FPTs using the specific procedural forms developed for that purpose. Prior to testing, these forms are provided to the CM for review and approval and to the Subs for review. The CxA will include the filled out forms with the turnover documents.

B. Non-Conformance.

1. The CxA will record the results of the FPT on the procedure or test form. All deficiencies or non-conformance issues shall be noted and reported to the CM.

2. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases the deficiency and resolution will be documented on the procedure form.

3. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or loosening acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the CM.

4. As tests progress and a deficiency is identified, the CxA discusses the issue with the executing contractor.

a. When there is no dispute on the deficiency and the Sub accepts responsibility to correct it:

1) The CxA documents the deficiency and the Sub’s response and intentions and they go on to another test or sequence. The Sub corrects the deficiency, signs the statement of correction at the bottom of the non-compliance form certifying that the equipment is ready to be retested and sends it back to the CxA.

2) The CxA reschedules the test and the test is repeated.

b. If there is a dispute about a deficiency, regarding whether it is a deficiency or who is responsible:

1) The deficiency shall be documented on the non-compliance form with the Sub's response and a copy given to the CM and to the Sub representative assumed to be responsible.
2) Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the CM.

3) The CxA documents the resolution process.

4) Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency, signs the statement of correction on the non-compliance form and provides it to the CxA. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

6. The Contractor shall respond in writing to the CxA and CM at least as often as commissioning meetings are being scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

7. The CxA retains the original non-conformance forms until the end of the project.

8. Any required retesting by any contractor shall not be considered a justified reason for a claim of delay or for a time extension by the prime contractor.

C. Approval. The CxA notes each satisfactorily demonstrated function on the test form. Formal approval of the FPT is made later after review by the CxA and by the CM, if necessary. The CxA recommends acceptance of each test to the CM. The CM gives final approval of each test by providing a signature on the test document.

3.6. COMMISSIONING MANUALS

A. Commissioning Record Data. The CxA is responsible to compile, organize and index the commissioning data into labeled, indexed and tabbed, three-ring binders and deliver it to the CM, to be included with the O&M manuals.

B. Final Report Details. The final commissioning report shall include an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope and a general description of testing and verification methods. For each piece of commissioned equipment, the report should contain the disposition of the commissioning authority regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas: 1) Equipment meeting the equipment specifications, 2) Equipment installation, 3) Functional performance and 4) Equipment documentation and Owner's Project Requirements. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment or operations, future actions, commissioning process changes, etc. shall also be listed. Each non-compliance issue shall be referenced to the specific functional test, inspection, trend log, etc. where the deficiency is documented.

3.7 DEFERRED TESTING

A. Unforeseen Deferred Tests. If any check or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of checklists and functional testing may be

delayed upon approval of the CM. These tests will be conducted in the same manner as the seasonal tests as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing. During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the appropriate Subs, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.8 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the Specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, their due dates, who receives and approves them and the location of the specification to create them. In summary, the written products are:

Product	Developed By	Filled Out By
1. Owner's Project Requirements (OPR)	Owner / A	Owner/ A
2. Basis of Design	Designers	Designers
3. Final Commissioning Plan	CxA	CxA
4. Commissioning Schedules	CxA with CM	CxA
5. Sequence Clarifications	Subs & A/E as needed	Subs
6. Prefunctional Checklists	CxA (sample in Specs)	Subs
7. Startup and Initial Checkout Plan	Subs	Subs
8. Final TAB Report	TAB	TAB
9. Issues Log (deficiencies)	CxA	CxA
10. Commissioning Progress Record	CxA	CxA
11. Functional Test Forms	CxA (sample in Specs)	CxA
12. Commissioning Record Book	CxA	CxA
13. Final Commissioning Report	CxA	CxA

B. Sample Commissioning Forms
1. Sample Prefunctional Checklist – See Attached
2. Sample Functional Performance Test – See Attached

SAMPLE PRE-FUNCTIONAL CHECKLIST

Turner	AHU PREFUNCTIONAL CHECKOUT SHEET	AHU-1

GENERAL INFORMATION:

Project:	Portland international Jetport
Location in Facility:	Mechanical Equipment Room
System Served:	Level 1

DOCUMENTATION INVENTORY:		Note
Owner's Project Requirements (OPR):	☐ Yes ☐ No ☐ N/A	
Engineer's Basis of Design:	☐ Yes ☐ No ☐ N/A	
Project Specifications:	☐ Yes ☐ No ☐ N/A	
• Sequence of Operations	☐ Yes ☐ No ☐ N/A	
Project Drawings (Contract & Coordination)	☐ Yes ☐ No ☐ N/A	
Manufacturer's Shop Drawing(s) (w/ Performance Data, fan curves, etc.)	☐ Yes ☐ No ☐ N/A	
Installation / Start-up Report (Manufacturer & Contractor):	☐ Yes ☐ No ☐ N/A	
Test and Balance Report:	☐ Yes ☐ No ☐ N/A	
Controls Point-to-Point Checkout Report:	☐ Yes ☐ No ☐ N/A	
• Approved Control Sequences	☐ Yes ☐ No ☐ N/A	
Manufacturer's Operations & Maintenance (O&M) Manual	☐ Yes ☐ No ☐ N/A	

NAMEPLATE CHECKOUT:

Prior to installation, enter requirements from specifications and compare to shop drawing data for compliance (note "N/P" if information is not provided, "N/A" if information is not applicable). Indicate deficiencies with a number in the "Note" column and detail below in the "Deficiencies" section. After installation, compare nameplate data to approved shop drawing information and denote deficiencies as above.

	Specifications	Shop Drawings	Installed	Note
Manufacturer	Trane	Trane		
Model Number	Solution-XTO-57x90	Solution-XTO-57x90		
Serial Number	N/A	N/A		
Type (Medium / Fuel / Size)	Air Handling Unit	Air Handling Unit		
Volts / Phase / Hertz	460/3/60	460/3/60		
Supply Flow (CFM)	12,600 CFM	12,600 CFM		
Return Flow (CFM)	12,600 CFM	12,600 CFM		
Outside Air Flow (CFM)	12,600 CFM	12,600 CFM		
Sup Ext Stat.Press.("w.c.)	1.9"	1.9"		
Ret Ext Stat Press (" w.c.)	1.6"	1.6"		
Supply Fan Power (HP)	25 hp	25 hp		
Return Fan Power (HP)	10 hp	10 hp		
Supply Motor Efficiency (%)	N/A	94%		
Return Motor Efficiency (%)	N/A	92%		
Heating Capacity (MBH)	408 MBH	408 MBH		
Heating EAT/LAT (°F)	49°F/78°F	49°F/78°F		
Heating EWT/LWT (°F)	140°F/180°F	140°F/180°F		
Heating Coil Flow (GPM)	22 gpm	21 gpm		
Cooling Capacity (MBH)	550 MBH	550 MBH		
Cooling EAT/LAT (°F)	82°F/53°F	82°F/53°F		
Cooling EWT/LWT (°F)	44°F/56°F	44°F/56°F		
Cooling Coil Flow (GPM)	97 gpm	96 gpm		
Heat / Enthalpy Wheel	Yes	Yes		

Turner	AHU PREFUNCTIONAL CHECKOUT SHEET	AHU-1

INSTALLATION CHECKOUT:
After component installation, check the following sampling of installation requirements to indicate compliance with contract documents. Check "Yes" if the item is compliant and "No" if not. Check "N/A" if the item is not applicable to this component. (NOTE: Checking "No" always indicates non-compliance, even for "No Leak" item.)

			Contr.	Note
General Items	ID tags affixed	☐ Yes ☐ No ☐ N/A	MC	
	Equipment in good condition	☐ Yes ☐ No ☐ N/A	MC	
	Equipment & components clean	☐ Yes ☐ No ☐ N/A	MC	
	Service area clean	☐ Yes ☐ No ☐ N/A	MC	
	Service area & access adequate	☐ Yes ☐ No ☐ N/A	MC	
	Safety guards & labels in place	☐ Yes ☐ No ☐ N/A	MC	
	Unit mounted properly	☐ Yes ☐ No ☐ N/A	MC	
	Vibration isolation installed	☐ Yes ☐ No ☐ N/A	MC	
	Unit shipping locks removed	☐ Yes ☐ No ☐ N/A	MC	
	Sound attenuation per specifications	☐ Yes ☐ No ☐ N/A	MC	
	Seismic restraints per specifications	☐ Yes ☐ No ☐ N/A	MC	
	Insulation complete per specifications	☐ Yes ☐ No ☐ N/A	MC	
	Access doors close tightly	☐ Yes ☐ No ☐ N/A	SC	
	Final filters in place	☐ Yes ☐ No ☐ N/A	SC	
	No exhaust air discharge proximity to air intakes and building openings	☐ Yes ☐ No ☐ N/A	SC	
Instrumentation	Temperature gauge(s) in place	☐ Yes ☐ No ☐ N/A	MC	
	Pressure gauge(s) in place	☐ Yes ☐ No ☐ N/A	MC	
	P/T plug(s) installed per details	☐ Yes ☐ No ☐ N/A	MC	
	Filter differential pressure gauge(s) in place	☐ Yes ☐ No ☐ N/A	SC	
	Freeze stat(s) installed per details	☐ Yes ☐ No ☐ N/A	SC	
	Static pressure sensor(s) installed per details	☐ Yes ☐ No ☐ N/A	SC	
	Air volume sensor(s) installed per details	☐ Yes ☐ No ☐ N/A	SC	
	Flow switch(es) installed	☐ Yes ☐ No ☐ N/A	MC	
	Flow meter(s) installed	☐ Yes ☐ No ☐ N/A	MC	
Local Piping	Piping correct per details	☐ Yes ☐ No ☐ N/A	MC	
	Type & flow direction labeled per specs.	☐ Yes ☐ No ☐ N/A	MC	
	Isolation valves installed per details	☐ Yes ☐ No ☐ N/A	MC	
	Balancing valves installed	☐ Yes ☐ No ☐ N/A	MC	
	Valves installed per details	☐ Yes ☐ No ☐ N/A	MC	
	Valves tags affixed	☐ Yes ☐ No ☐ N/A	MC	
	Strainers in place	☐ Yes ☐ No ☐ N/A	MC	
	Strainers have been cleaned	☐ Yes ☐ No ☐ N/A	MC	
	Drains installed	☐ Yes ☐ No ☐ N/A	MC	
	Condensate pipe appears properly pitched	☐ Yes ☐ No ☐ N/A	MC	
	Insulation complete per specifications	☐ Yes ☐ No ☐ N/A	MC	
Local Ductwork	Duct correct per details	☐ Yes ☐ No ☐ N/A	SC	
	Type & flow direction labeled per specs.	☐ Yes ☐ No ☐ N/A	SC	
	Turning vanes in square elbows per plans	☐ Yes ☐ No ☐ N/A	SC	
	Motorized dampers in place per details	☐ Yes ☐ No ☐ N/A	SC	
	Manual dampers in place per plans	☐ Yes ☐ No ☐ N/A	SC	
	Damper linkages have limited "play"	☐ Yes ☐ No ☐ N/A	SC	
	Damper(s) close tightly	☐ Yes ☐ No ☐ N/A	SC	
	Fire & smoke dampers in place per plans	☐ Yes ☐ No ☐ N/A	SC	
	Duct smoke detectors in place per details	☐ Yes ☐ No ☐ N/A	EC	
	Safeties in place (i.e. High Static) per details	☐ Yes ☐ No ☐ N/A	CC	
	Insulation complete per specifications	☐ Yes ☐ No ☐ N/A	MC	

Turner	AHU PREFUNCTIONAL CHECKOUT SHEET		AHU-1	
General Power & Controls	Power to unit & disconnect installed	☐ Yes ☐ No ☐ N/A	EC	
	Electrical disconnect in view from unit	☐ Yes ☐ No ☐ N/A	EC	
	Starter/VFD installed per specs & labeled	☐ Yes ☐ No ☐ N/A	EC	
	Terminations & panel circuit labeled	☐ Yes ☐ No ☐ N/A	EC	
	All electrical components grounded	☐ Yes ☐ No ☐ N/A	EC	
	All electrical connections appear tight	☐ Yes ☐ No ☐ N/A	EC	
	All fire alarm wiring complete	☐ Yes ☐ No ☐ N/A	EC	
	Electrical system safeties in place	☐ Yes ☐ No ☐ N/A	EC	
	Overload heater(s) installed per specs	☐ Yes ☐ No ☐ N/A	EC	
	Auxiliary heater(s) in place	☐ Yes ☐ No ☐ N/A	EC	
	Control safeties in place	☐ Yes ☐ No ☐ N/A	CC	
	All control devices in place & connected	☐ Yes ☐ No ☐ N/A	CC	
Motors	Supply motor lubricated	☐ Yes ☐ No ☐ N/A	MC	
	Supply motor field alignment complete (documents rec'd)	☐ Yes ☐ No ☐ N/A	MC	
	Supply belt tension & condition good	☐ Yes ☐ No ☐ N/A	MC	
	Supply adjustable belt drive in place	☐ Yes ☐ No ☐ N/A	MC	
	Return motor lubricated	☐ Yes ☐ No ☐ N/A	MC	
	Return motor field alignment complete (documents rec'd)	☐ Yes ☐ No ☐ N/A	MC	
	Return belt tension & condition good	☐ Yes ☐ No ☐ N/A	MC	
	Return adjustable belt drive in place	☐ Yes ☐ No ☐ N/A	MC	
	Exhaust motor lubricated	☐ Yes ☐ No ☐ N/A	MC	
	Exhaust motor field alignment complete (documents rec'd)	☐ Yes ☐ No ☐ N/A	MC	
	Exhaust belt tension & condition good	☐ Yes ☐ No ☐ N/A	MC	
	Exhaust adjustable belt drive in place	☐ Yes ☐ No ☐ N/A	MC	
Heat Recovery	Heat wheel free & clear of debris	☐ Yes ☐ No ☐ N/A	MC	
	Heat wheel seals close to wheel but not restricting rotation	☐ Yes ☐ No ☐ N/A	MC	
	Heat wheel lubricated	☐ Yes ☐ No ☐ N/A	MC	
	Heat wheel belt tension & condition good	☐ Yes ☐ No ☐ N/A	MC	
	Heat wheel adjustable belt drive in place	☐ Yes ☐ No ☐ N/A	MC	
Coils	Heating coil fins clean & condition good	☐ Yes ☐ No ☐ N/A	MC	
	Cooling coil fins clean & condition good	☐ Yes ☐ No ☐ N/A	MC	

DEFICIENCIES:

Turner	AHU PREFUNCTIONAL CHECKOUT SHEET	AHU-1

ACCEPTANCE:
The above equipment and systems integral to them are complete and ready for functional testing. The checklist items are complete and have been checked off only by parties having direct knowledge of the event, as marked below, respective to each responsib
respective to each responsible contractor. This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report. This Prefunctional Checklist is submitted to the Owner's Representative
for approval, subject to an attached list of outstanding items yet to be completed. None of the outstanding items preclude safe and reliable functional tests being performed.

Mechanical Contractor (MC)	Date	Controls Contractor (CC)	Date
Sheetmetal Contractor (SC)	Date	Electrical Contractor (EC)	Date
Plumbing Contractor (PC)	Date	Testing & Balancing Contractor (TB)	Date
General Contractor (GC)	Date		

This filled-out checklist has been reviewed. Its completion is approved with the exceptions noted above.

Commissioning Agent _____ Date: _____

Owner's Representative _____ Date: _____

SAMPLE FUNCTIONAL PERFORMANCE TEST
(Test is a representative sample and does not necessarily meet sequence requirements for this project.)

PROJECT: PORTLAND INTERNATIONAL JETPORT	TEST NUMBER:	FPT-Sample
	SYSTEM TAG:	AHU-1

SYSTEM FUNCTIONAL PERFORMANCE TEST

PROJECT: **Portland International Jetport**

SYSTEM TYPE: **Air Handling Unit System Test**

UNIT(s): **AHU-1**

TEST #: **FPT-SAMPLE**

System Approval Signatures:

Commissioning Authority's Representative:_____ Date:_____

Owner's Representative:_____ Date:_____

Contractor's Representative:_____ Date:_____

PROJECT: PORTLAND INTERNATIONAL JETPORT	TEST NUMBER:	FPT-Sample
	SYSTEM TAG:	AHU-1

INDEX

PROJECT: PORTLAND INTERNATIONAL JETPORT	TEST NUMBER:	FPT-Sample
	SYSTEM TAG:	AHU-1

1. TEST PURPOSE

This test will verify the performance of the installed Variable Air Volume Air Handling Unit (AHU-1) and to verify its ability to operate as intended by the design and sequence of operations.

2. TEST PROCEDURE

This test procedure will verify start up, operation, shut down, interlock and failures modes for the AHU. This will be done by verifying the flowing sequences: (See Index on page 2 for detailed test breakdown.)

- Start-Up & Shut-Down Modes
- Warm-Up and Cool-Down Modes
- Source Temperature Optimization
- Unit Failures
- Alarms

3. PARTICIPANTS

Party	Participants (Name Printed)	Participation (Check All Applicable)
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐
_____	_____	Sys. Operation ☐ Document ☐ Witness ☐

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample
SYSTEM TAG: AHU-1

4. SEQUENCE OF OPERATIONS

A. General

1. BAS shall monitor and report all control function alarm points.
2. BAS shall monitor and report status of all equipment for use in sequence of operations, trending and verification. BAS shall also monitor all modulated valve and damper positions as indicated.
3. All safeties shall operate whether the starters of VFD's are in the hand or automatic mode.
4. In the event of a fire or fire alarm signal, all classroom fan coil units and core ventilation units shall shut down. Units may restart upon reset procedure.

B. Safeties, General

1. Supply or return duct smoke detectors shall shutdown the AHU upon detection of products of combustion, or a signal from the central fire system. BAS shall monitor status and receive alarm upon detection activation.
2. Duct mounted smoke dampers or combination fire smoke dampers shall only close upon activation of signal from central fire alarm panel to BAS. Dampers shall open after fire alarm system is reset to normal by BAS. BAS shall alarm if damper is not open while fire alarm system is in normal, safe mode.
3. Upon central fire alarm shut-down of all air handling units, fire alarm must be set to normal mode. BAS shall automatically stage the re-start of air handling units to eliminate simultaneous starting.
4. The freeze protection sensor element on the leaving side of the hot water coil, shall de-energize the unit, and fully open the HWS valve, and initiate an alarm if the temperature at the coil sensor drops below 38°F. Manual reset required. During occupied mode, sensor shall modulate HW control valve to maintain unit casing temp above 45°F.
5. Supply and return duct mounted high limit pressure sensors shall shut down both S and R fans if discharge or inlet pressures exceed pressure classification rating of either ductwork or fans, and alarm at BAS.

C. Control of Outside Air, General

1. Outside air is controlled to satisfy whichever of the following predominated:
   a) A minimum of 10% of rated air volume.
   b) The outside air volume required to satisfy the economizer cycle.
   c) The outside air volume required to MAINTAIN a CO2 differential.
   d) OA intake will be limited to a maximum of the "design OA CFM' which is shown in the Schedule of air handling units. Limit is not applicable to economizer cycle.

D. Optimum Start

1. Each air handling unit system start up sequence shall include an optimal start routine. BAS shall trend respective systems, collecting information on warm-up/cool-down temperature setpoints. BAS shall automatically adjust start-up schedules to achieve warm-up/cool-down based on trended dated.

E. Night Setback - BAS shall reset all space temperatures during occupied areas to the following schedule:

1. All spaces, except telecommunication closets and elevator machine rooms :55°F (adj)
2. If any space shall drop below setback temperature, respective systems shall energize and remain in operation until space temperature rises 3°F (adj) above setback setpoint.

F. Carbon Dioxide Control, General

1. BAS shall monitor return air CO2 sensor or space sensor (min. of 2 sensors to be averaged at all times) and modulate outside air dampers from units from 10% min, to maximum scheduled. BAS shall continually poll space mounted CO2 sensors and override return air CO2 sensor to maintain desired levels of outside air within the building .
2. Initially set the return and space CO2 sensors for 350 ppm above the outside ambient readings (minimal setting of 530 ppm total outside and inside with maximum setting or 650 ppm.) Ambient CO2 levels to be provided by Balancing Contractor as specified in 15990.
3. In units with multiple CO2 sensors, if BAS fails to read a signal from any of the CO2 sensors or the sensor fails, an alarm shall be generated and remaining sensor(s) shall maintain control of outside air. If only a single sensor resides, failure of remaining sensors, and or sensor failure occurs, then the unit's outside air dampers shall remain at last known position and an alarm be generated. Operator may override any failed CO2 sensor.

G. Enthalpy Economizer

1. Provide each air handling unit with an enthalpy controlled economizer, unless otherwise noted. When outside air enthalpy is less than return air enthalpy and at least one zone calling for cooling, controls shall modulate the outside air dampers, return air dampers, and relief dampers, prior to staging of chilled water valve, to maintain supply air setpoint. Position of outside air damper shall be overridden by CO2 sensors if levels of CO2 are outside of defined setpoint. Position of outside air dampers shall be overridden by mixed air low limit.
2. If outside air enthalpy is above return air enthalpy and CO2 levels are satisfied, outside air dampers shall be at minimum position.

H. VFD Status; BAS systems shall monitor VFD fault alarms and associated motor speeds.

I. When supply fan is shut down, the outside and relief/spill dampers are shut tight, and heating coil valve is controlled by air sensors immediately downstream of coil. Upon a signal from the BAS system to start, the return damper shall open with exhaust and outside air damper fully closed, energize supply and return air fan. Fans shall be controlled under specific modes of operation.

J. Hours of operation will be set at the building's central panel, Modes of operation will be:

1. Unoccupied Cooling (ambient temperature above 55°F); outdoor air dampers are closed, fan is stopped. Cooling coil valves are shut.
2. Unoccupied Heating (ambient temperature below 55°F); outside air dampers are closed. Fans are off. Heating coil valves are under control of sensors immediately downstream of coils shall modulate to maintain minimum inside casing temperature of 45°F. When room temperature drops to 55°F, warm-up cycle (as described below) is actuated. Then space temperature rises to 65°F, warm up terminates and fan stops.
3. Cool down or Warm up (Optimal schedule).
   a. Prior to occupied operation the supply and return fan start, run with outside dampers shut, and under duct pressure control. After a 3 minute runtime, the system reverts to a cool down or warm up mode, depending upon temperature of return air.
   b. If return air temperature is above 80°F, cool down commences. OA dampers are shut. Exhaust fans are off. Chilled water valve is modulated under control of return air temperature. Normal occupied cooling resumes after room air temperature comes down to 75°F.

c. If return air temperature is below 68°F, warm-up commences. Return air sensor modulates the hot water control valve, subject to a high limit of 95°F discharge air temperature. Warm up terminates when return air temperature has remained above 72°F for a preset time period (try 30 minutes initially). Adjust the time delay as needed to allow for thermal capacitance of building construction materials.

4. Occupied Summer (ambient temperature above 55°F). A temperature sensor downstream from the cooling coil, as reset by a return air sensor, remote zone calling for cooling and subject to maintain maximum return relative humidity at 55% will, through its controller, modulate the chilled water control valve.

5. Occupied Winter (ambient temperature below 55°F).The fan discharge sensor modulated variable outside air dampers and heating coil control valve in sequence (with dead band between). Provide independent low limit controllers immediately downstream of heating coils, set at 45°F. Employ a supply temperature reset schedule as with occupied summer.

K. Occupied Heating or Cooling

1. Associated exhaust fans per AC unit shall be energized to run through the BAS system only when the building is in the occupied mode per the following schedule:

Air handling Unit	Exhaust Fan
AHU-1	Integral

L. Supply Fan Control

1. A static pressure pick-up sensor is located approximately 2/3rds down the main supply duct. The sensor will modulate a variable frequency fan speed controller, to maintain the static pressure setting. BAS shall monitor the position of all VAV box dampers and airflow. BAS shall reset supply discharge static pressure to zone, requiring the most pressure, or until at least one VAV box is nearly wide open, and all remaining VAV zone temperatures are satisfied. A high limit pressure sensor shall alarm for above normal pressures, and a second higher set point shall shut down the fan.

2. A supply and return airflow monitor shall modulate the return fan variable speed controller, so that the return air volume is 90% of the supply volume minus the exhaust volume. When this is zero, the return fan will shut down. BAS shall monitor the return airflow to verify this CFM offset.

M. Control of Air Damper

1. The outside air (OA) and return air (RA) dampers shall be electronically interconnected, so that when the OA damper is open, the RA damper is closed.

2. The relief damper controller is a static pressure sensor located in the relief plenum to control the damper as required to hold a constant positive pressure in the plenum. This is activated by a rise in plenum pressure approx 0.1" above setpoint.

3. BAS shall monitor the position of duct mounted smoke dampers and alarm if damper fails to operate.

PROJECT: PORTLAND INTERNATIONAL JETPORT TEST NUMBER: FPT-Sample
SYSTEM TAG: AHU-1

5. OPERATOR WORK STATION CHECKOUT

This table compares actual field measured readings to those provided on the Operator's Work Station (OWS). Compliance is indicated by checking the "Pass" box and failure is indicated by checking the "Fail" box. If changes are required or deficiencies identified, place a number in the "Note" box (in sequential order) and provide a detailed description at the back of this document in the "Test Notes and System Deficiencies" section.

AHU Unit Performance Testing	Field Reading	OWS Reading	Performance Pass	Performance Fail	Note:
Analog Input Data Points					
Discharge Air Temperature (set point _____) (°F)			☐	☐	
Mixed Air Temperature (°F)			☐	☐	
Return Air CO2 (°F)			☐	☐	
Duct Static Pressure			☐	☐	
Digital Input Data Points					
Supply Fan Alarm			☐	☐	
Return Fan Alarm			☐	☐	
Supply Smoke Detector			☐	☐	
High Static Alarm Discharge			☐	☐	
High Static Alarm Return			☐	☐	
Low temperature (Freeze Stat) Alarm			☐	☐	
Supply Fan Status			☐	☐	
Exhaust Fan Status			☐	☐	
Filter Differential Status			☐	☐	
Analog Output Data Points					
Hot Water Valve Position (% Open) Winter			☐	☐	
Chill Water Valve Position (% Open) Summer			☐	☐	
Outside Air Damper Position			☐	☐	
Return Air Damper Position			☐	☐	
Exhaust Air Damper Position			☐	☐	
Supply Fan Speed Control			☐	☐	
Return Fan Speed Control			☐	☐	
Digital Output Data Points					
Supply Fan Start/Stop			☐	☐	
Exhaust Fan Start/Stop			☐	☐	

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample
SYSTEM TAG: AHU-1

6. SEQUENCE OF OPERATION VERIFICATION

For the following steps, enter the date the step was verified into the "Date Checked" box to indicate compliance. If changes are required or deficiencies identified, place a number in the "Note" box (in sequential order) and provide a detailed description at the back of this document in the "Test Notes and System Deficiencies" section.

	Note	Date Checked
6.1. OCCUPIED MODE (ON)		
6.1.1. With unit not in economizer, verify the OSA damper open to minimum. Minimum Position Set point: _____% OPEN		
6.1.2. With unit not in economizer, verify the return damper open to maximum. Maximum Position Set point: _____% OPEN		
6.1.3. Exhaust dampers should open the same percentage as the OSA Damper.		
6.1.4. Supply Fan energizes.		
6.1.5. Exhaust Fan energizes.		
6.1.6. Verify HW/CHW Valve is positioned correctly based on current conditions.		
6.2. UNOCCUPIED MODE (OFF)		
6.2.1. Verify Supply and Exhaust Fans are OFF.		
6.2.2. Verify the OSA damper and Exhaust dampers are closed.		
6.2.3. Verify the RA dampers are open 100%.		
6.2.4. Verify the HW/CHW Valve is closed if during Summer season.		
6.2.5. Verify the HW/CHW Valve is maintaining a unit temperature of 45°F if during Winter season.		
6.3. STATIC PRESSURE CONTROL (Supply Fan Volume Control)		
6.3.1. Record supply static pressure at sensor mounted 2/3 of the way down the supply duct, supply and exhaust fan speed. Supply static pressure set point = ____"WC SF Speed:____ % Current supply static pressure = ____"WC EF Speed:____ %		
6.3.2. Verify the following is true: Return cfm = (Supply cfm X 90%) – Exhaust cfm NOTE: If the calculation equals a value of zero, the exhaust fan should be off.		

PROJECT: PORTLAND INTERNATIONAL JETPORT **TEST NUMBER: FPT-Sample**
SYSTEM TAG: AHU-1

	Note	Date Checked
6.3.3. Verify at least one VAV box is at or near 100% open.		
6.3.4. Record the current discharge air temperature set point. Discharge Air Setpoint_____°F		
6.3.5. Override all VAV boxes to minimum flow by raising the space temp. set point 20°F above space temp.		
6.3.6. Verify the VFD ramps down the supply and exhaust fan speeds to maintain the supply static pressure set point. Supply static pressure setpoint= _____ "WC Supply static pressure = _____ "WC SF Speed: _____% EF Speed: _____ %		
6.3.7. Verify the following is true: Return cfm = (Supply cfm X 90%) – Exhaust cfm NOTE: If the calculation equals a value of zero, the exhaust fan should be off.		
6.3.8. Verify at least one VAV box is at or near 100% open.		
6.3.9. Record the discharge air temperature set point. Discharge Air Setpoint_____°F		
6.3.10. Override all VAV boxes to max. cooling by lowering the space temp. set point 20°F below space temp.		
6.3.11. Verify the VFD ramps up the supply and exhaust fan speeds to maintain the supply static pressure set point. Supply static pressure setpoint= _____ "WC Supply static pressure = _____ "WC SF Speed: _____% EF Speed: _____ %		
6.3.12. Verify the following is true: Return cfm = (Supply cfm X 90%) – Exhaust cfm NOTE: If the calculation equals a value of zero, the exhaust fan should be off.		
6.3.13. Verify at least one VAV box is at or near 100% open.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample
SYSTEM TAG: AHU-1

	Note	Date Checked
6.3.14. Record the discharge air temperature set point. Discharge Air Setpoint_____°F		
6.3.15. Return all set points and readings to normal operation.		
CO2 Override Checkout		
6.3.16. Record the ambient and return air CO2 readings, as well as the return air CO2 setpoint. Verify the return air setpoint is 350 ppm above the current ambient reading, being no lower than 530 ppm and no higher than 650 ppm. Ambient Air CO2 Reading: _____ ppm Average Space CO2 Reading: _____ ppm Return Air CO2 Reading: _____ ppm Return Air CO2 Setpoint: _____ ppm		
6.3.17. Adjust the CO2 setpoint to a value lower than the return reading.	Note 2	
6.3.18. Verify outside air dampers open to lower the CO2 value.		
6.3.19. With CO2 reading higher for Average Space than for Return Air, adjust the CO2 setpoint to a value above Return CO2, but below Average Space value.		
6.3.20. Verify outside air dampers open to lower the CO2 value.		
6.3.21. Return all set points and readings to normal operation.		

6.4. (HEATING) MORNING WARM-UP

6.4.1. Initiate the start of warm-up mode by the following steps.

1. Set the AHU to unoccupied mode.
2. Start the AHU in 15 minutes
3. Set Warm-Up S.P. to equal 5°F (adj.) above current R.A.T. (Warm up commences when RAT is below 68 °F)

6.4.2. Verify Supply and Return Fans start and ramp up to equal flow S.P. for a time period of 3 minutes.		
6.4.3. Verify the OSA damper and Exhaust dampers are closed.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.4.4. Verify the RA dampers are open.		
6.4.5. After the initial 3 minute run period, verify that the HW Valve modulates for 95 °F discharge temp.		
6.4.6. Once R.A.T remains above the Warm-Up set point of 72 °F for a preset time period, (Design = 30 minutes), warm-up mode is terminated and unit shall modulate normally. (Note: To simulate meeting S.P. adjust Warm-Up S.P. to equal current R.A.T.)		
6.4.7. Return all set points and readings to normal operation.		

6.5. (COOLING) MORNING COOL-DOWN

6.5.1. Initiate the start of cool-down mode by the following steps.

1. Set the RTU to unoccupied mode.
2. Start the RTU in 15 minutes.
3. Set the Cool-Down S.P. to equal 5°F (adj.) below current R.A.T. (Cool Down commences when RAT is above 80 °F)

6.5.2. Verify Supply Fan is RUNNING.		
6.5.3. Verify Exhaust Fan is OFF.		
6.5.4. Verify the OSA damper and Exhaust dampers are closed.		
6.5.5. Verify the RA dampers are open 100%.		
6.5.6. After the initial 3 minute run period, verify that the chill water cooling valve opens to meet Cool Down set point of 75 °F.		
6.5.7. Verify that normal Occupied Mode is initiated once R.A.T. reaches 75 °F.		
6.5.8. Return all set points and readings to normal operation.		

6.6. HEATING CAPACITY STAGING

6.6.1. If the OSAT is > 55°F, override the OSAT to be 45°F or change the system Occupied Winter heating enable set point to 5 °F above the current OSAT. Simulate the need for heating in the system.

6.6.2. Outside air damper should be at minimum.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.6.3. Observe the hot water valve opens and modulates to maintain supply air set point.		
6.6.4. Return all overridden set points and readings to normal operation.		

6.7. COOLING CAPACITY STAGING

Economizer Temperature Control

6.7.1. If required, simulate economizer mode by adjusting economizer enthalpy setpoint differential to less than return air enthalpy.		
6.7.2. Once system is in economizer mode, lower space temperature setpoints for at least one zone, to initiate economizer cooling.		
6.7.3. Verify economizer damper opens to maintain setpoint.		
6.7.4. With economizer damper less than 100%, verify chill water valve is closed.		
6.7.5. If setpoint can not be met with economizer damper open to 100%, verify chill water cooling is enabled.		

Economizer CO2 Override

6.7.6. Adjust the CO2 setpoint to lower than actual reading.	Note 2	
6.7.7. Verify outside air dampers open to lower the CO2 value.		
6.7.8. Return all set points and readings to normal operation.		

Economizer Humidity Control

6.7.9. With system is in economizer mode, lower the return air Relative Humidity (RH) setpoint to a value below the current return air RH reading.		
6.7.10. Verify economizer damper begins to close to maintain setpoint.		
6.7.11. Return all set points and readings to normal operation.		

Mechanical Cooling Checkout

6.7.12. Simulate need for chill water cooling by adjusting Occupied Summer setpoint to equal 5°F below current OSA conditions.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.7.13. Once system is in cooling mode, lower space temperature setpoints to initiate chill water cooling.		
6.7.14. Verify chill water valve is modulating to maintain setpoint.		
6.7.15. Verify economizer damper is open at minimum position.		
6.7.16. Release all overrides and return system to normal operation.		
6.8. MIXED AIR LOW LIMIT		
6.8.1. With the economizer damper open past minimum and the system calling for cooling or additional ventilation, change the MA low limit set point to be above the current MA temperature.		
6.8.2. Verify the Outside air damper modulates closed to maintain MA setpoint. (OSA Damper should not close below minimum.)		
6.8.3. Return all set points and readings to normal operation.		
6.9. UNOCCUPIED (HEAT)		
6.9.1. Initiate the start of unoccupied mode by changing the time of day schedule.		
6.9.2. Simulate a drop in space temperature below setpoint (Design = 55°F) by adjusting the unoccupied low temp setpoint to a value above the current lowest space temperature and verify the following:	Note3	
1. Verify the Supply and Exhaust Fans enable on.		
2. Verify the OSA damper and Exhaust dampers are closed.		
3. Verify the RA Dampers are open to 100%.		
4. Verify HW Valve is modulated to maintain 95 °F discharge temperature.		
6.9.3. Simulate a rise in space temperature above the setpoint (Design = 65°F) by adjusting the unoccupied low temperature setpoint to a value equal to or less than the current lowest space temperature: Verify the AHU shuts down.		
6.9.4. Release all overrides and return system to normal operation.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.10. NIGHT SETBACK		
6.10.1. If required, simulate night setback by changing the time of day on schedule		
6.10.2. Verify all space temperatures are set to 55 °F (adj) at designated time. This excludes Tel-Comm closets and elevator machine rooms.		
6.10.3. Verify any spaces that drop below setpoint, the respective system shall energize and operate until space is 3 °F (adj) above setpoint		
6.10.4. Release all overrides and return system to normal operation.		
6.11. UNOCCUPIED (COOLING)		
6.11.1. Verify fans remain off during unoccupied mode in Summer season.		
6.12. OPTIMUM START		
6.12.1. Using trend log information, verify optimum start program is operating per specification.		
6.13. FAILURES		
6.13.1. Supply Fan Failure (VFD Fault)	Note 1	
6.13.2. Simulate VFD failure by switching Hand-Off-Auto switch to OFF.		
6.13.3. Verify an alarm is sent to the OWS indicating a VFD failure.		
6.13.4. Reset unit to normal operation.		
6.13.5. Return Fan Failure (VFD Fault)	Note 1	
6.13.6. Simulate VFD failure by switching Hand-Off-Auto switch to OFF.		
6.13.7. Verify an alarm is sent to the OWS indicating a VFD failure.		
6.13.8. Reset unit to normal operation.		
6.13.9. CO2 Sensor Failure		
6.13.10. With the AHU running, simulate a CO2 sensor failure condition.		
6.13.11. Verify an alarm is registered at the OWS.		
6.13.12. With the AHU running, simulate the failure of the remaining CO2 sensors for this system.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.13.13. Verify the OSA damper remains in the last commanded position and an alarm is registered at the OWS.		
6.13.14. Reset unit to normal operation.		

6.14. EXTERNAL SHUTDOWNS AND ALARMS

6.14.1. High Static Safety

Supply Duct Safety

6.14.2. With the AHU running, simulate a high static alarming condition in the discharge duct.

High Pressure Alarming Setpoint: _____"W.C.

6.14.3. Verify an alarm is registered at the OWS.		
6.14.4. With the AHU running, simulate a high static shutdown condition in the discharge duct.		

High Pressure Shutdown Setpoint: _____"W.C.

6.14.5. Verify the unit shuts down.		
6.14.6. Manually reset static safety switch before the unit is allowed to restart.		

Return Duct Safety

6.14.7. With the AHU running, simulate a high static alarming condition in the return duct.

High Pressure Alarming Setpoint: _____"W.C.

6.14.8. Verify an alarm is registered at the OWS.		
6.14.9. With the AHU running, simulate a high static shutdown condition in the return duct.		

High Pressure Shutdown Setpoint: _____"W.C.

6.14.10. Verify the unit shuts down.		
6.14.11. Manually reset static safety switch before the unit is allowed to restart.		
6.14.12. Reset unit to normal operation.		

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample | SYSTEM TAG: AHU-1

	Note	Date Checked
6.14.13. Duct Smoke Detector Alarms		
Supply Duct Smoke Detector		
6.14.14. Using the "test" setting on the supply air smoke detector, initiate a "smoke" alarm.		
6.14.15. Verify the unit completely shuts down. Also verify an alarm is registered at the OWS and a fire alarm is generated.		
6.14.16. Verify duct mounted smoke dampers close after activation from central alarm panel to BAS.		
6.14.17. Reset smoke detector and clear alarms.		
Return Duct Smoke Detector		
6.14.18. Using "test" setting on return air smoke detector, initiate smoke alarm.		
6.14.19. Verify the unit completely shuts down. Also verify an alarm is registered at the OWS and a fire alarm is generated.		
6.14.20. Verify duct mounted smoke dampers close after activation from central alarm panel to BAS.		
6.14.21. Reset smoke detector and clear alarms.		
6.14.22. Duct Smoke Damper Alarms		
6.14.23. Simulate a failure of the duct smoke dampers.		
6.14.24. Verify an alarm is registered at the OWS and a fire alarm is generated.		
6.14.25. Reset unit to normal operation.		
6.14.26. Low Temp Alarm (Freeze Protection)		
6.14.27. Press test button on freeze stat to simulate low temperature condition.		
6.14.28. Verify the following: 1. Unit shuts OFF (Supply & Exhaust Fans). 2. OSA Damper closes. 3. RA Damper opens. 4. Hot Water Control Valve opens 100%.		

COMMISSIONED BY: Turner | PAGE: 16 of 18 | DATE: 10/22/09 REVISION: BASE

	Note	Date Checked
6.14.29. Verify an alarm is registered at the OWS.		
6.14.30. Reset set point and clear alarm and verify unit returns to appropriate sequence operation.		
6.14.31. VFD Hand Safety Checkout		
6.14.32. With VFD in HAND, verify the following safeties:		
6.14.33. Verify the High Static Safety sequence. (See Step 6.14.1).		
6.14.34. Verify the Smoke Detector Safety sequence (See Step 6.14.13).		
6.14.35. Verify the Low Temperature Safety sequence. (See Step 6.14.26).		
6.14.36. Reset set points and clear alarms and verify return to normal operation.		

7. POST TEST CONFIGURATION

Circle the configuration that the major system components were left in at the completion of testing.

Supply Fan	Off	–	Manual	–	Automatic
Exhaust Fan	Off	–	Manual	–	Automatic
HW/CHW Valve	Off	–	Manual	–	Automatic
OSA Damper	Off	–	Manual	–	Automatic

PROJECT: PORTLAND INTERNATIONAL JETPORT | TEST NUMBER: FPT-Sample
SYSTEM TAG: AHU-1

8. TEST NOTES AND SYSTEM DEFICIENCIES

Provide enough detailed information to clearly indicate what the deficiency is and what the conditions were when the deficiency occurred.

END OF TEST

COMMISSIONED BY: Turner

PAGE: 18 of 18

DATE: 10/22/09
REVISION: BASE

END OF SECTION

SECTION 01 81 13 - SUSTAINABLE DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes general requirements and procedures for compliance with certain USGBC LEED prerequisites and credits needed for Project to obtain LEED Silver certification based on LEED-NC, Version 2.2.

1. Other LEED prerequisites and credits needed to obtain LEED certification depend on material selections and may not be specifically identified as LEED requirements. Compliance with requirements needed to obtain LEED prerequisites and credits may be used as one criterion to evaluate substitution requests and comparable product requests.
2. Additional LEED prerequisites and credits needed to obtain the indicated LEED certification depend on Architect's design and other aspects of Project that are not part of the Work of the Contract.
3. A copy of the LEED Project checklist is attached at the end of this Section for information only.

B. Related Sections:

1. Divisions 01 through 33 Sections for LEED requirements specific to the work of each of these Sections. Requirements may or may not include reference to LEED.

1.3 DEFINITIONS

A. Chain-of-Custody Certificates: Certificates signed by manufacturers certifying that wood used to make products was obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship." Certificates shall include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

B. LEED: Leadership in Energy & Environmental Design.

C. Rapidly Renewable Materials: Materials made from plants that are typically harvested within a 10-year or shorter cycle. Rapidly renewable materials include products made from bamboo, cotton, flax, jute, straw, sunflower seed hulls, vegetable oils, or wool.

D. Regional Materials: Materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site. If only a fraction of a product or

material is extracted/harvested/recovered and manufactured locally, then only that percentage (by weight) shall contribute to the regional value.

E. Regionally Manufactured Materials: Materials that are manufactured within a radius of 500 miles (800 km) from Project site. Manufacturing refers to the final assembly of components into the building product that is installed at Project site.

F. Regionally Extracted and Manufactured Materials: Regionally manufactured materials made from raw materials that are extracted, harvested, or recovered within a radius of 500 miles (800 km) from Project site.

G. Recycled Content: The recycled content value of a material assembly shall be determined by weight. The recycled fraction of the assembly is then multiplied by the cost of assembly to determine the recycled content value.

1. "Post-consumer" material is defined as waste material generated by households or by commercial, industrial, and institutional facilities in their role as end users of the product, which can no longer be used for its intended purpose.
2. "Pre-consumer" material is defined as material diverted from the waste stream during the manufacturing process. Excluded is reutilization of materials such as rework, regrind, or scrap generated in a process and capable of being reclaimed within the same process that generated it.

H. Recycled Content: The percentage by weight of constituents that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer), or after consumer use (post-consumer).

1. Spills and scraps from the original manufacturing process that are combined with other constituents after a minimal amount of reprocessing for use in further production of the same product are not recycled materials.
2. Discarded materials from one manufacturing process that are used as constituents in another manufacturing process are pre-consumer recycled materials.

1.4 ACTION SUBMITTALS

A. General: Submit additional LEED submittals required by other Specification Sections.

B. LEED submittals are in addition to other submittals. If submitted item is identical to that submitted to comply with other requirements, submit duplicate copies as a separate submittal to verify compliance with indicated LEED requirements.

C. LEED Documentation Submittals:
1. Credit MR 2.1 and Credit MR 2.2: Comply with Division 01 Section "Construction Waste Management and Disposal."
2. Credit MR 4.1: Product data and certification letter indicating percentages by weight of post-consumer and pre-consumer recycled content for products having recycled content. Include statement indicating costs for each product having recycled content.
3. Credit MR 5.1: Product data for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each

raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

4. Credit MR 5.1: Product data indicating location of material manufacturer for regionally manufactured materials. Include statement indicating cost for each regionally manufactured material and for each regionally extracted and manufactured material.

    a. Include statement indicating distance from manufacturer to Project for each regionally manufactured material.
    b. Include statement indicating location of and distance from Project to point of extraction, harvest, or recovery for each raw material used in regionally extracted and manufactured materials.

5. Credit MR 7: Product data and chain-of-custody certificates for products containing certified wood. Include statement indicating cost for each certified wood product.
6. Credit EQ 3.1:

    a. Construction indoor-air-quality management plan.
    b. Product data for temporary filtration media.
    c. Product data for filtration media used during occupancy.
    d. Construction Documentation: Six photographs at three different times during the construction period, along with a brief description of the SMACNA approach employed, documenting implementation of the indoor-air-quality management measures, such as protection of ducts and on-site stored or installed absorptive materials.

7. Credit EQ 3.2:

    a. Report from testing and inspecting agency indicating results of indoor-air-quality testing and documentation showing compliance with indoor-air-quality testing procedures and requirements.

8. Credit EQ 4.1: Product data for adhesives and sealants used inside the weatherproofing system indicating VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).
9. Credit EQ 4.2: Product data for paints and coatings used inside the weatherproofing system indicating chemical composition and VOC content of each product used. Indicate VOC content in g/L calculated according to 40 CFR 59, Subpart D (EPA Method 24).
10. Credit EQ 4.4: Product data for products containing composite wood or agrifiber products or wood glues indicating that they do not contain urea-formaldehyde resin.

1.5 INFORMATIONAL SUBMITTALS

A. Project Materials Cost Data: Provide statement indicating total cost for building materials used for Project, excluding mechanical, electrical, and plumbing components, and specialty items such as elevators and equipment. Include statement indicating total cost for wood-based materials used for Project.

B. LEED Action Plans: Provide preliminary submittals within 30 days of date established for the Guaranteed Maximum Price award indicating how the following requirements will be met:

1. Credit MR 2.1 and Credit MR 2.2: Waste management plan complying with Division 01 Section "Construction Waste Management and Disposal."
2. Credit MR 4.1: List of proposed materials with recycled content. Indicate cost, post-consumer recycled content, and pre-consumer recycled content for each product having recycled content.
3. Credit MR 5.1: List of proposed regional materials. Identify each regional material, including its source, cost, and the fraction by weight that is considered regional.
4. Credit MR 5.1: List of proposed regionally manufactured materials and regionally extracted and manufactured materials.

    a. Identify each regionally manufactured material, including its source and cost.
    b. Identify each regionally extracted and manufactured material, including its source and cost.

5. Credit MR 7: List of proposed certified wood products. Indicate each product containing certified wood, including its source and cost of certified wood products.
6. Credit EQ 3.1: Construction indoor-air-quality management plan.

C. LEED Progress Reports: Concurrent with each Application for Payment, submit reports comparing actual construction and purchasing activities with LEED action plans for the following:

1. Credit MR 2.1 and Credit MR 2.2: Waste reduction progress reports complying with Division 01 Section "Construction Waste Management and Disposal."
2. Credit MR 4.1: Recycled content.
3. Credit MR 5.1: Regional materials.
4. Credit MR 5.1: Regionally manufactured materials.
5. Credit MR 7: Certified wood products.

1.6 QUALITY ASSURANCE

A. LEED Coordinator: Engage an experienced LEED-Accredited Professional to coordinate LEED requirements. LEED coordinator may also serve as waste management coordinator.

PART 2 - PRODUCTS

2.1 RECYCLED CONTENT OF MATERIALS

A. Credit MR 4.1: Provide building materials with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 10 percent of cost of materials used for Project.

1. Cost of post-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.
2. Cost of post-consumer recycled content plus one-half of pre-consumer recycled content of an item shall be determined by dividing weight of post-consumer recycled content plus

one-half of pre-consumer recycled content in the item by total weight of the item and multiplying by cost of the item.

3. Do not include mechanical and electrical components in the calculation.

2.2 REGIONAL MATERIALS

A. Credit MR 5.1: Provide 10 percent of building materials (by cost) that are regional materials.

2.3 CERTIFIED WOOD

A. Credit MR 7: Provide a minimum of 50 percent (by cost) of wood-based materials that are 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. Wood-based materials include, but are not limited to, the following materials when made from wood, engineered wood products, or wood-based panel products:

    a. Rough carpentry.
    b. Miscellaneous carpentry.
    c. Heavy timber construction.
    d. Wood decking.
    e. Structural glued-laminated timber.
    f. Finish carpentry.
    g. Architectural woodwork.
    h. Wood flooring.

2.4 LOW-EMITTING MATERIALS

A. Credit EQ 4.1: For field applications that are inside the weatherproofing system, use adhesives and sealants that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Wood Glues: 30 g/L.
2. Metal to Metal Adhesives: 30 g/L.
3. Adhesives for Porous Materials (Except Wood): 50 g/L.
4. Subfloor Adhesives: 50 g/L.
5. Plastic Foam Adhesives: 50 g/L.
6. Carpet Adhesives: 50 g/L.
7. Carpet Pad Adhesives: 50 g/L.
8. Cove Base Adhesives: 50 g/L.
9. Gypsum Board and Panel Adhesives: 50 g/L.
10. Rubber Floor Adhesives: 60 g/L.
11. Ceramic Tile Adhesives: 65 g/L.
12. Multipurpose Construction Adhesives: 70 g/L.
13. Fiberglass Adhesives: 80 g/L.
14. Contact Adhesive: 80 g/L.
15. Structural Glazing Adhesives: 100 g/L.
16. Wood Flooring Adhesive: 100 g/L.

17. Structural Wood Member Adhesive: 140 g/L.
18. Special Purpose Contact Adhesive (contact adhesive that is used to bond melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber or wood veneer 1/16 inch or less in thickness to any surface): 250 g/L.
19. Top and Trim Adhesive: 250 g/L.
20. Plastic Cement Welding Compounds: 350 g/L.
21. ABS Welding Compounds: 400 g/L.
22. CPVC Welding Compounds: 490 g/L.
23. PVC Welding Compounds: 510 g/L.
24. Adhesive Primer for Plastic: 650 g/L.
25. Sheet Applied Rubber Lining Adhesive: 850 g/L.
26. Aerosol Adhesive, General Purpose Mist Spray: 65 percent by weight.
27. Aerosol Adhesive, General Purpose Web Spray: 55 percent by weight.
28. Special Purpose Aerosol Adhesive (All Types): 70 percent by weight.
29. Other Adhesives: 250 g/L.
30. Architectural Sealants: 250 g/L.
31. Nonmembrane Roof Sealants: 300 g/L.
32. Single-Ply Roof Membrane Sealants: 450 g/L.
33. Other Sealants: 420 g/L.
34. Sealant Primers for Nonporous Substrates: 250 g/L.
35. Sealant Primers for Porous Substrates: 775 g/L.
36. Modified Bituminous Sealant Primers: 500 g/L.
37. Other Sealant Primers: 750 g/L.

B. Credit EQ 4.2: For field applications that are inside the weatherproofing system, use paints and coatings that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) and the following chemical restrictions:

1. Flat Paints, Coatings, and Primers: VOC not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC not more than 150 g/L.
3. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.
5. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
6. Floor Coatings: VOC not more than 100 g/L.
7. Shellacs, Clear: VOC not more than 730 g/L.
8. Shellacs, Pigmented: VOC not more than 550 g/L.
9. Stains: VOC not more than 250 g/L.
10. Flat Interior Topcoat Paints: VOC not more than 50 g/L.
11. Nonflat Interior Topcoat Paints: VOC not more than 150 g/L.
12. Anticorrosive and Antirust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
13. Clear Wood Finishes, Varnishes and Sanding Sealers: VOC not more than 350 g/L.
14. Clear Wood Finishes, Lacquers: VOC not more than 550 g/L.
15. Floor Coatings: VOC not more than 100 g/L.
16. Shellacs, Clear: VOC not more than 730 g/L.
17. Shellacs, Pigmented: VOC not more than 550 g/L.
18. Stains: VOC not more than 250 g/L.
19. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
20. Dry-Fog Coatings: VOC not more than 400 g/L.

21. Zinc-Rich Industrial Maintenance Primers: VOC not more than 340 g/L.
22. Pretreatment Wash Primers: VOC not more than 420 g/L.
23. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
24. 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.

C. Credit EQ 4.4: Do not use composite wood or agrifiber products or adhesives that contain urea-formaldehyde resin.

PART 3 - EXECUTION

3.1 MEASUREMENT AND VERIFICATION

3.2 CONSTRUCTION WASTE MANAGEMENT

A. Credit MR 2.1 and Credit MR 2.2: Comply with Division 01 Section "Construction Waste Management and Disposal."

3.3 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

A. Credit EQ 3.1: Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Division 01 Section "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Credit EQ 3.2:

1. Air-Quality Testing:

a. Conduct baseline indoor-air-quality testing, after construction ends and prior to occupancy, using testing protocols consistent with the EPA's "Compendium of Methods for the Determination of Air Pollutants in Indoor Air," and as additionally detailed in the USGBC's "LEED-NC: Reference Guide."
b. Demonstrate that the contaminant maximum concentrations listed below are not exceeded:

1) Formaldehyde: 50 ppb.
2) Particulates (PM10): 50 micrograms/cu. m.
3) Total Volatile Organic Compounds (TVOC): 500 micrograms/cu. m.
4) 4-Phenylcyclohexene (4-PH): 6.5 micrograms/cu. m.
5) Carbon Monoxide: 9 ppm and no greater than 2 ppm above outdoor levels.

c. For each sampling point where the maximum concentration limits are exceeded, conduct additional flush-out with outside air and retest the specific parameter(s) exceeded to indicate the requirements are achieved. Repeat procedure until all requirements have been met. When retesting noncomplying building areas, take samples from same locations as in the first test.
d. Air-sample testing shall be conducted as follows:

1) All measurements shall be conducted prior to occupancy but during normal occupied hours, and with building ventilation system starting at the normal daily start time and operated at the minimum outside air flow rate for the occupied mode throughout the duration of the air testing.
2) Building shall have all interior finishes installed including, but not limited to, millwork, doors, paint, carpet, and acoustic tiles. Nonfixed furnishings such as workstations and partitions are encouraged, but not required, to be in place for the testing.
3) Number of sampling locations will vary depending on the size of building and number of ventilation systems. For each portion of building served by a separate ventilation system, the number of sampling points shall not be less than one per 25,000 sq. ft. (2300 sq. m) or for each contiguous floor area, whichever is larger, and shall include areas with the least ventilation and greatest presumed source strength.

4) Air samples shall be collected between 3 and 6 feet (0.9 and 1.8 m) from the floor to represent the breathing zone of occupants, and over a minimum four-hour period.

END OF SECTION 01 81 13

LEED for New Construction v2.2
Registered Project Checklist

Project Name: Portland International Jetport (PWM) Terminal Addition and Renovation
Project Address: Portland, Maine Gensler Proj: 09.6395.000 file 3ER

Yes	?	No			
5		**9**	**Sustainable Sites**		**14** Points
Y			Prereq 1	**Construction Activity Pollution Prevention**	Required
		1	Credit 1	**Site Selection**	1
		1	Credit 2	**Development Density & Community Connectivity**	1
		1	Credit 3	**Brownfield Redevelopment**	1
		1	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
1			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
1			Credit 4.3	**Alternative Transportation**, Low-Emitting & Fuel-Efficient Vehicles	1
1			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
		1	Credit 5.1	**Site Development,** Protect or Restore Habitat	1
		1	Credit 5.2	**Site Development,** Maximize Open Space	1
		1	Credit 6.1	**Stormwater Design,** Quantity Control	1
1			Credit 6.2	**Stormwater Design,** Quality Control	1
		1	Credit 7.1	**Heat Island Effect,** Non-Roof	1
1			Credit 7.2	**Heat Island Effect,** Roof	1
		1	Credit 8	**Light Pollution Reduction**	1

Yes	?	No			
4		**1**	**Water Efficiency**		**5** Points
1			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
1			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
		1	Credit 2	**Innovative Wastewater Technologies**	1
1			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
1			Credit 3.2	**Water Use Reduction**, 30% Reduction	1

5		**3**	**Energy & Atmosphere**		**17** Points
Y			Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	Required
Y			Prereq 2	**Minimum Energy Performance**	Required
Y			Prereq 3	**Fundamental Refrigerant Management**	Required

***Note for EAc1**: All LEED for New Construction projects registered after June 26th, 2007 are required to achieve at least two (2) points under EAc1.

3			Credit 1	**Optimize Energy Performance**	1 to 10
				10.5% New Buildings or 3.5% Existing Building Renovations	1
				14% New Buildings or 7% Existing Building Renovations	2
			3	17.5% New Buildings or 10.5% Existing Building Renovations	3
				21% New Buildings or 14% Existing Building Renovations	4
				24.5% New Buildings or 17.5% Existing Building Renovations	5
				28% New Buildings or 21% Existing Building Renovations	6
				31.5% New Buildings or 24.5% Existing Building Renovations	7
				35% New Buildings or 28% Existing Building Renovations	8
				38.5% New Buildings or 31.5% Existing Building Renovations	9
				42% New Buildings or 35% Existing Building Renovations	10
		1	Credit 2	**On-Site Renewable Energy**	1 to 3
				2.5% Renewable Energy	1
				7.5% Renewable Energy	2
				12.5% Renewable Energy	3
		1	Credit 3	**Enhanced Commissioning**	1
1			Credit 4	**Enhanced Refrigerant Management**	1
		1	Credit 5	**Measurement & Verification**	1
1			Credit 6	**Green Power**	1

Yes	?	No			
5		8	**Materials & Resources**		**13** Points
Y			Prereq 1	**Storage & Collection of Recyclables**	Required
		1	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	1
		1	Credit 1.2	**Building Reuse**, Maintain 100% of Existing Walls, Floors & Roof	1
		1	Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	1
1			Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	1
1			Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	1
		1	Credit 3.1	**Materials Reuse**, 5%	1
		1	Credit 3.2	**Materials Reuse**,10%	1
1			Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	1
		1	Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	1
1			Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regio	1
		1	Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regio	1
		1	Credit 6	**Rapidly Renewable Materials**	1
1			Credit 7	**Certified Wood**	1
Yes	?	No			
11		4	**Indoor Environmental Quality**		**15** Points
Y			Prereq 1	**Minimum IAQ Performance**	Required
Y			Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
1			Credit 1	**Outdoor Air Delivery Monitoring**	1
		1	Credit 2	**Increased Ventilation**	1
1			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
1			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
1			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
1			Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	1
1			Credit 4.3	**Low-Emitting Materials**, Carpet Systems	1
1			Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	1
1			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
		1	Credit 6.1	**Controllability of Systems**, Lighting	1
		1	Credit 6.2	**Controllability of Systems**, Thermal Comfort	1
1			Credit 7.1	**Thermal Comfort**, Design	1
1			Credit 7.2	**Thermal Comfort**, Verification	1
1			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
		1	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1
Yes	?	No			
5			**Innovation & Design Process**		**5** Points
1			Credit 1.1	**Innovation in Design**:95% Construction Waste Recycle	1
1			Credit 1.2	**Innovation in Design**: Bldg as teaching tool / education	1
1			Credit 1.3	**Innovation in Design**: 20% reduced parking rate for fuel efficient vehic	1
1			Credit 1.4	**Innovation in Design**: Green housekeeping	1
1			Credit 2	**LEED® Accredited Professional**	1
Yes	?	No			
35		25	**Project Totals** (pre-certification estimates)		**69** Points

Certified: 26-32 points, **Silver:** 33-38 points, **Gold:** 39-51 points, **Platinum:** 52-69 po

SECTION 02 30 00 – SUBSURFACE INVESTIGATION

PART 1 - GENERAL

1.1 REQUIREMENTS INCLUDED

A. Examination of the Site:

1. Before submitting bids, the Contractor shall visit the site and inform himself as to the location, nature of the work, equipment and facilities needed, general and local conditions prevailing at the site and all matters which may affect the work under this contract.
2. Before submitting bids, the Contractor shall examine all sources of information concerning ground water levels and subsurface soil conditions. Each bidder shall draw his own conclusions concerning how these affect his work. Conditions which would not permit the Contractor to fulfill the intent of the contract shall be brought to the attention of the Owner consistent with Notice to Contractors.
3. Subsurface Information: A geotechnical data report summarizing subsurface conditions has been prepared for the project by Haley & Aldrich, Inc., dated 13 October 2008, and is included as an attachment to this Section for reference.

B. Test Boring Results:

1. The Owner assumes no responsibility for the accuracy of the test results as shown in the geotechnical report. This information is included only as a general indication of the materials likely to be found adjacent to the holes drilled at the site of the proposed work. The Contractor shall examine this data and other preliminary data, and shall base their bid on their opinion of the conditions likely to be encountered. The Contractor may elect to perform their own investigation at no cost to the Owner to further inform themselves of existing subsurface conditions in advance of bid. Additional Contractor investigation in advance of bid shall be coordinated through Owner.
2. The bidder's submission of his proposal shall be considered "prima facie" evidence that he has made his examination as described in this Section.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

ATTACHMENTS: "Geotechnical Data Report, Proposed Terminal Expansion, Portland International Jetport, Portland, Maine," prepared by Haley & Aldrich, Inc., dated 13 October 2008.

END OF SECTION 02 30 00

SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

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

B. See Division 01 Section "Construction Waste Management and Disposal" for disposal of demolished materials.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, use of elevator and stairs, and locations of temporary partitions and means of egress.

B. Predemolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Comply with Division 01 Section "Photographic Documentation." Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1. Comply with submittal requirements in Division 01 Section "Construction Waste Management and Disposal."

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

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Predemolition Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

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

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

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

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

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

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

1.6 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 and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.

1. Comply with requirements specified in Division 01 Section "Photographic Documentation."

G. 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.

B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

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.

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

3.4 SELECTIVE DEMOLITION

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

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
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. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
5. Dispose of demolished items and materials promptly. Comply with requirements in Division 01 Section "Construction Waste Management and Disposal."

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

C. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint 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.

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

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

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

B. Burning: Do not burn demolished materials.

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 02 41 19

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.
4. Suspended slabs.

B. Related Sections include the following:

1. Division 03 Section "Architectural Concrete" for general building applications of specially finished formed concrete.
2. Division 03 Section "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.
3. Division 31 Section "Earth Moving" for drainage fill under slabs-on-grade.
4. Division 32 Section "Concrete Paving" for concrete pavement and walks.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit MR 4.1: 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. Design Mixtures for Credit ID 1.1: For each concrete mixture containing fly ash as a replacement for portland cement or other portland cement replacements and for equivalent concrete mixtures that do not contain portland cement replacements.

C. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

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

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

E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.

1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.

F. Welding certificates.

G. Qualification Data: For Installer, manufacturer and testing agency.

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

1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

I. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Steel reinforcement and accessories.
5. Waterstops.
6. Curing compounds.
7. Floor and slab treatments.
8. Bonding agents.
9. Adhesives.
10. Vapor retarders.
11. Semirigid joint filler.
12. Joint-filler strips.
13. Repair materials.

J. Floor surface flatness and levelness measurements to determine compliance with specified tolerances.

K. Field quality-control test and inspection reports.

L. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. Welding: Qualify procedures and personnel according to AWS D1.4, "Structural Welding Code--Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

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

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.

c. Ready-mix concrete manufacturer.
d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
2. Products: Subject to compliance with requirements, provide one of the products specified.
3. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
4. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.

C. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will produce surfaces with gradual or abrupt irregularities not

exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

D. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

E. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

F. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

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

C. Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

D. Plain-Steel Wire: ASTM A 82.

E. Deformed-Steel Wire: ASTM A 496.

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

G. Deformed-Steel Welded Wire Reinforcement: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Epoxy-Coated Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, ASTM A 775/A 775M epoxy coated.

C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

D. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.

E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.5 CONCRETE MATERIALS

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

1. Portland Cement: ASTM C 150, Type I/II,.

B. Silica Fume: ASTM C 1240, amorphous silica.

C. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Lightweight Aggregate: ASTM C 330, 3/4 inch nominal maximum aggregate size.

E. Water: ASTM C 94/C 94M.

2.6 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

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

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

2.7 WATERSTOPS

A. Flexible PVC Waterstops: CE CRD-C 572, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers:

   a. Bometals, Inc.
   b. Greenstreak.
   c. Meadows, W. R., Inc.
   d. Murphy, Paul Plastics Co.
   e. Progress Unlimited, Inc.
   f. Tamms Industries, Inc.
   g. Vinylex Corp.

2. Profile: Ribbed with center bulb Ribbed without center bulb.
3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

2.8 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Available Products:

a. Anti-Hydro International, Inc.; AH Clear Cure WB.
b. Burke by Edoco; Spartan Cote WB II.
c. ChemMasters; Safe-Cure & Seal 20.
d. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Cure and Seal WB.
e. Dayton Superior Corporation; Safe Cure and Seal (J-18).
f. Euclid Chemical Company (The); Aqua Cure VOX.
g. Kaufman Products, Inc.; Cure & Seal 309 Emulsion.
h. Lambert Corporation; Glazecote Sealer-20.
i. L&M Construction Chemicals, Inc.; Dress & Seal WB.
j. Meadows, W. R., Inc.; Vocomp-20.
k. Metalcrete Industries; Metcure.
l. Nox-Crete Products Group, Kinsman Corporation; Cure & Seal 150E.
m. Symons Corporation, a Dayton Superior Company; Cure & Seal 18 Percent E.
n. Tamms Industries, Inc.; Clearseal WB 150.
o. Unitex; Hydro Seal.
p. US Mix Products Company; US Spec Hydrasheen 15 percent
q. Vexcon Chemicals, Inc.; Starseal 309.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, 18

2.10 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.

B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.

C. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types I and II, non-load bearing, IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Reglets: Fabricate reglets of not less than 0.0217-inch- thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

F. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

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

1. Use water-reducing high-range, water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

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

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

B. Foundation Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.

C. Interior Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Air Content: 3 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
3. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
4. Maximum Ultimate Shrinkage: 0.06 percent.

D. Suspended Slabs: Proportion lightweight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Air Content: 3 percent, plus or minus 1.5 percent at point of delivery for 3/4-inch nominal maximum aggregate size.
3. Air Content: Do not allow air content of troweled finished floors to exceed 3 percent.
4. Maximum Ultimate Shrinkage: 0.06 percent.

2.14 FABRICATING REINFORCEMENT

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

2.15 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116, and furnish batch ticket information.

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

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

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

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

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. SUMMARY

1. Products Supplied Under This Section

    a. Vapor barrier, seam tape, mastic, and pipe boots for installation under concrete slabs.

2. Related Sections

    a. Section 03 30 00 Cast-in-place Concrete
    b. Section 07 26 00 Vapor Retarders

B. REFERENCES

1. American Society for Testing and Materials (ASTM)

    a. ASTM E 1745-97 (2004) Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs
    b. ASTM E 154-99 (2005) Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs
    c. ASTM E 96-05 Standard Test Methods for Water Vapor Transmission of Materials
    d. ASTM F 1249-06 Standard Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor
    e. ASTM E 1643-98 (2005) Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs

2. American Concrete Institute (ACI)

    a. ACI 302.1R-04 Vapor barrier component (plastic membrane) is not less than 10 mils thick.

C. SUBMITTALS

1. Quality Control / Assurance

    a. Manufacturer’s samples, literature
    b. Manufacturer’s installation instructions for placement, seaming and pipe boot installation

D. MATERIALS

1. Vapor Barrier must have all of the following qualities:

a. Permeance of less than 0.01 Perms [grains/(ft^2 *hr * in.Hg)] per ASTM F 1249 or ASTM E 96
b. ASTM E 1745 Class A

2. Vapor Barrier products:

a. Stego Wrap Vapor Barrier (15-mil) by Stego Industries LLC, (877) 464-7834 www.stegoindustries.com.
b. Zero Perm Vapor Barrier by Alumiseal
c. Or equal product that meets all performance criteria.

E. ACCESSORIES

1. Seam Tape:

a. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96

2. Vapor Proofing Mastic:

a. Permeance less than 0.3 perms per ASTM F 1249 or ASTM E 96

3. Pipe Boots

a. Construct pipe boots from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

F. PREPARATION

1. Ensure that subsoil is approved by Geotechnical Engineer or Owners Testing Agency.
a. Level and tamp or roll aggregate, sand or granular base.

G. INSTALLATION

1. Install vapor barrier in accordance with manufacturer's instructions and ASTM E 1643-98 (2005).

a. Unroll vapor barrier with the longest dimension parallel with the direction of the concrete pour.
b. Lap vapor barrier over footings and/or seal to foundation walls.
c. Overlap joints 6 inches and seal with manufacturer's tape.
d. Seal all penetrations (including pipes) per manufacturer's instructions.
e. No penetration of the vapor barrier is allowed except for reinforcing steel and permanent utilities.
f. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6 inches and taping all four sides with tape.

3.5 STEEL REINFORCEMENT

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

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

1. Weld reinforcing bars according to AWS D1.4, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.

3.8 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time

necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces not exposed to public view.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view,.

C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.

1. Apply scratch finish to surfaces indicated.

C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces indicated.

D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

    a. Specified overall values of flatness, F(F) 25; and of levelness, F(L) 20; with minimum local values of flatness, F(F) 17; and of levelness, F(L) 15.

3. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot- long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 1/8 inch

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

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

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

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.12 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

    a. Water.
    b. Continuous water-fog spray.
    c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped

at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project..

3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

a. After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.13 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least [**one**] [**six**] month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

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

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension in solid concrete, but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.

D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel reinforcement placement.
2. Steel reinforcement welding.
3. Headed bolts and studs.
4. Verification of use of required design mixture.
5. Concrete placement, including conveying and depositing.
6. Curing procedures and maintenance of curing temperature.
7. Verification of concrete strength before removal of shores and forms from beams and slabs.

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

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

7. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
    b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.

8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
    b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

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

E. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00

03 36 00 SPECIAL CONCRETE FLOOR FINISHES

PART 1 GENERAL

1. 1 SUMMARY

A. This section includes the following.
   1. Polishing concrete to specified finish level and applying Joint Sealant, Sealer and Hardener.

B. Related Work:
   1. Section 03 30 00 Cast-In-Place Concrete
   2. Section 07 92 00 Joint Sealants

1.2 REFERENCES

A. American Society for Testing and Materials:
   1. ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
   2. ASTM G23-81, Ultraviolet Light & Water Spray
   3. ASTM C805, Impact Strength

B. American Concrete Institute
   1. ACI 302. 1R-89, Guide for Concrete Floor and Slab Construction

C. Other Test:
   1. Reflectivity

1.3 SUBMITTALS

A. Comply with pertinent provisions of Division 1 section- Product Requirements.
   1. Provide submittal information within 35 calendar days after the contractor has received the owner's notice to proceed.

B . Product data:
   1. Submit special concrete finishes manufacturer's specifications and test data.
   2. Submit special concrete finishes describing product to be provided, giving manufacturer’s name and product name for the specified material proposed to be provided under this section.
   3. Submit special concrete finishes manufacturer's recommended installation procedures; which when approved by the Architect, will become the basis for accepting or rejecting actual installation procedures used on the work.
   4. Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
   5. Submit special concrete finishes manufacturer’s Material Safety Data Sheet (MSDS) and other safety requirements.
   6. Follow all special concrete finishes published manufacturer’s installation instructions.

C. Test Reports:
1. Provide certified test reports, prepared by an independent testing laboratory, confirming compliance with specified performance criteria.

D. LEED Submittals:

2. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
3. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 QUALITY ASSURANCE

A. Installer Qualifications:
1. Use an experienced installer and adequate number of skilled workmen who are thoroughly trained and experienced in the necessary craft.
2. The special concrete finish manufacturer shall certify applicator.
3. Applicator shall be familiar with the specified requirements and the methods needed for proper performance of work of this section.

B. Manufacturer’s Certification:
1. Provide letter of certification from concrete finish manufacturer stating that installer is certified applicator of special concrete finishes, and is familiar with proper procedures and installation requirements required by the manufacturer.

C. Mock-ups:
1. Apply mock-ups of each type finish, to demonstrate typical joints, surface finish, color variation (if any), and standard of workmanship.
   a. Build mock-ups approximately 50 square feet in the location indicated or if not indicated, as directed by the Architect or Owner Representative.
   b. Notify Architect or Owner Representative seven days in advance of dates and times when mock-ups will be constructed.
   c. Obtain from the Architect or Owner Representative approval of mock-ups before starting construction.
   d. If the Architect or Owner Representative determines that mock-ups do not meet requirements, demolish and remove them from the site and cast others until mock-ups are approved.
   e. Maintain mock-ups during construction in an undisturbed condition as a standard for judging the completed work.

D. Protection

1. No satisfactory chemical or cleaning procedure is available to remove petroleum stains from the concrete surface. Prevention is therefore essential.
   a. All hydraulic powered equipment must be diapered to avoid staining of the concrete.
   b. No trade will park vehicles on the inside slab or consume food products as to prevent premature staining . If necessary to complete their scope of work, impervious floor protection will be placed under vehicles at all times.
   c. No pipe cutting machine will be used on the inside floor slab.
   d. Steel will not be placed on interior slab to avoid rust staining.
   e. Acids and acidic detergents will not come into contact with slab.
   f. All trades informed that the slab must be protected at all times as a finished product will be in place during construction.

E. Concrete Placement and Pre-Installation Conference:
   1. Conduct conference at project site to comply with requirements in Division 1 Section " Project Management and Coordination"

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original containers, with seal's unbroken, bearing manufacturer labels indicating brand name and directions for storage.

B. Dispense special concrete finish material from factory numbered and sealed containers. Maintain record of container numbers.

1.6 PROJECT CONDITIONS

A. Environmental limitations:
   1. Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
      a. Concrete Floor Flatness rating recommended at least 40, where possible.
      b. Concrete Floor Levelness rating recommended at least 30, where possible.
      c. Concrete must be cured a minimum of 45 days or as directed by the manufacturer before application of Retro Plate can begin.
      d. Application of Retro-Plate shall take place 10 days prior to installation of equipment and substantial completion, thus providing a complete, uninhibited concrete slab for application.

B. Close areas to traffic during floor application and after application, for time period recommended in writing by manufacturer.

PART 2 – PRODUCTS

2.1 MATERIALS AND MANUFACTURERS

A. POLISHED CONCRETE PROCESS- Basis of Design
1. Retro-Plate Concrete Polishing System or approved equal
   a. Large Aggregate, Level 3 finish (1800 grit)

B. HARDENING/SEALING AGENT- Basis of Design
2. Retro-Plate 99, manufactured by Advanced Floor Products, Inc., Distributed by the Righter Group Wilimington MA or approved equal
   b. Performance Criteria:
      i. Abrasion Resistance: ASTM C779 – Up to 400% increase in abrasion resistance.
      ii. Impact Strength: ASTM C805 – Up to 21% increase impact strength.
      iii. Ultra Violet Light and Water Spray: ASTM G23-81 – No adverse effect to ultra violet and water spray.
      iv. Reflectivity: Up to 30% increase in reflectivity.
3. Certified Applicators
4. Manufacturer's Regional Representative
5. Equal Products by BASF, Bayer or Bomanite will be considered should they meet the desired design intent and performance of the specified materials .

2.2 RELATED MATERIALS

A. Neutralizing Agent:
1. Tri-sodium Phosphate

B. Water:
1. Potable

C. Sawcut control joint filler:
1. Fill all sawcut control joints flush with finish floor with Polyurea sealant (see Section 07 92 00 Joint Sealants)

PART 3- EXECUTION

3.1 SURFACE CONDITIONS:

A. Examine substrate, with installer present, for conditions affecting performance of finish. Correct conditions detrimental to timely and proper work. Do not proceed until unsatisfactory conditions are corrected.

B. Verify that base slab meet finish and surface profile requirements in Division 3 Section "Cast-In-Place Concrete," and Project Conditions above.

C. Prior to application, verify that floor surfaces are free of construction latents.

3.2 APPLICATION

A. Start any of the floor finish applications in presence of manufacturer's technical representative.

B. Sealing, Hardening and Polishing of Concrete Surface
1. Concrete must be in place a minimum of 45 days or as directed by the manufacturer before application can begin.
2. Application is to take place at least 10 days prior to racking and other in-store accessory installation, thus providing a complete, uninhibited concrete slab for application
3. Only a certified applicator shall apply Retro-Plate 99. Applicable procedures must be followed as recommended by the product manufacturer and as required to match approved test sample.
4. Achieve waterproofing, hardening, dust-proofing, and abrasion resistance of the surface without changing the natural appearance of the concrete, except for the sheen.
5. Polish to required sheen level 3 finish, exposed aggregate is desired by the owner to achieve desired finish, method and depth to be determined at mock up.
6. Apply two coats of Reteogard at 600-800 square feet per gallon immediately after finish polishing has occurred Owner must reapply on monthly basis to maintain quality of finish.

3.3 WORKMANSHIP AND CLEANING:

A. The premises shall be kept clean and free of debris at all times.

B. Remove spatter from adjoining surfaces, as necessary.

C. Repair damages to surface caused by cleaning operations.

D. Remove debris from jobsite
1. Dispose of materials in separate, closed containers in accordance with local regulations.

3.4 PROTECTION:

A. Protect finished work until fully cured in accordance with manufacturer's recommendations.

END OF SECTION 03 36 00

SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Architectural precast concrete column covers and exterior wall panels.

1.2 DEFINITION

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish and texture, preapproved by Architect.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide architectural precast concrete units and connections capable of withstanding the following design loads within limits and under conditions indicated:

1. Loads: As indicated.

1.4 SUBMITTALS

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

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings: Detail fabrication and installation of architectural precast concrete units. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit. Indicate joints, reveals, and extent and location of each surface finish. Indicate details at building corners.

1. Comprehensive engineering analysis signed and sealed by the qualified professional engineer responsible for its preparation. Show governing panel types, connections, and types of reinforcement, including special reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

D. Samples: For each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of 3, illustrating full range of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches (300 by 300 by 50 mm).

E. Welding certificates.

F. Material test reports: For aggregates.

G. Material Certificates: Signed by manufacturers:

H. Field quality-control test and special inspection reports.

I. LEED Submittal:

1. Product Data for Credit MR 4.1: 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.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Participates in PCI's plant certification program at time of bidding and is designated a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units.

B. Design Standards: Comply with ACI 318 (ACI 318M) and design recommendations of PCI MNL 120, "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of architectural precast concrete units indicated.

C. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

D. Welding: Qualify procedures and personnel according to AWS D1.1/D.1.1M, "Structural Welding Code - Steel"; and AWS D1.4, "Structural Welding Code - Reinforcing Steel."

E. Calculated Fire-Test-Response Characteristics: Where indicated, provide architectural precast concrete units whose fire resistance has been calculated according to ACI 216.1/TMS 0216.1, "Standard Method for Determining Fire Resistance of Concrete and Masonry Construction Assemblies," and is acceptable to authorities having jurisdiction.

F. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of 1 sample panel approximately 16 sq. ft. (1.5 sq. m) in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

PART 2 - PRODUCTS

2.1 REINFORCING MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 60 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

D. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from galvanized steel wire into flat sheets.

E. Deformed-Steel Welded Wire Reinforcement: ASTM A 497/A 497M, flat sheet.

F. Supports: Suspend reinforcement from back of mold or use bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place according to PCI MNL 117.

G. Prestressing Strand: ASTM A 416/A 416M, Grade 270 (Grade 1860), uncoated, 7-wire, low-relaxation strand.

1. Coat unbonded post-tensioning strand with corrosion inhibitor passing ASTM D 1743 and sheath with polypropylene tendon sheathing. Include anchorage devices and coupler assemblies.

2.2 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type III, gray, unless otherwise indicated.

1. For surfaces exposed to view in finished structure, mix gray with white cement, of same type, brand, and mill source.

B. Supplementary Cementitious Materials:

1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
2. Metakaolin Admixture: ASTM C 618, Class N.
3. Silica Fume Admixture: ASTM C 1240, with optional chemical and physical requirement.
4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

C. Normal-Weight Aggregates: Except as modified by PCI MNL 117, ASTM C 33, with coarse aggregates complying with Class 5S. Stockpile fine and coarse aggregates for each type of exposed finish from a single source (pit or quarry) for Project.

1. Face-Mixture-Coarse Aggregates: Selected, hard, and durable; free of material that reacts with cement or causes staining; to match selected finish sample.

a. Gradation: Uniformly graded.

2. Face-Mixture-Fine Aggregates: Selected, natural or manufactured sand of same material as coarse aggregate, unless otherwise approved by Architect.

D. Coloring Admixture: ASTM C 979, synthetic or natural mineral-oxide pigments or colored water-reducing admixtures, temperature stable, and nonfading.

E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

F. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

2.3 STEEL CONNECTION MATERIALS

A. Carbon-Steel Shapes and Plates: ASTM A 36/A 36M.

B. Carbon-Steel Headed Studs: ASTM A 108, AISI 1018 through AISI 1020, cold finished, AWS D1.1/D1.1M, Type A or B, with arc shields and with minimum mechanical properties of PCI MNL 117, Table 3.2.3.

C. Carbon-Steel Plate: ASTM A 283/A 283M.

D. Malleable Iron Castings: ASTM A 47/A 47M.

E. Carbon-Steel Castings: ASTM A 27/A 27M, Grade 60-30 (Grade 415-205).

F. High-Strength, Low-Alloy Structural Steel: ASTM A 572/A 572M.

G. Carbon-Steel Structural Tubing: ASTM A 500, Grade B.

H. Wrought Carbon-Steel Bars: ASTM A 675/A 675M, Grade 65 (Grade 450).

I. Deformed-Steel Wire or Bar Anchors: ASTM A 496 or ASTM A 706/A 706M.

J. Carbon-Steel Bolts and Studs: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts and studs; carbon-steel nuts, ASTM A 563 (ASTM A 563M); and flat, unhardened steel washers, ASTM F 844.

K. High-Strength Bolts and Nuts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts; heavy hex carbon-steel nuts, ASTM A 563 (ASTM A 563M); and hardened carbon-steel washers, ASTM F 436 (ASTM F 436M).

L. Zinc-Coated Finish: For exterior steel items, steel in exterior walls, and items indicated for galvanizing, apply zinc coating by hot-dip process according to ASTM A 123/A 123M or ASTM A 153/A 153M electrodeposition according to ASTM B 633, SC 3, Types 1 and 2.

1. Galvanizing Repair Paint: High-zinc-dust-content paint with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

M. Shop-Primed Finish: Prepare surfaces of nongalvanized steel items, except those surfaces to be embedded in concrete, according to requirements in SSPC-SP 3 and shop-apply lead- and chromate-free, rust-inhibitive primer, complying with performance requirements in MPI 79 according to SSPC-PA 1.

2.4 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C 150, Type I, and clean, natural sand, ASTM C 144 or ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, Grade A for drypack and Grades B and C for flowable grout and of consistency suitable for application within a 30-minute working time.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C 881/C 881M, of type, grade, and class to suit requirements.

2.5 CONCRETE MIXTURES

A. Prepare design mixtures for each type of precast concrete required.

1. Limit use of fly ash and silica fume to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.

B. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.

C. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 (ACI 318M) or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

D. Normal-Weight Concrete Mixtures: Proportion mixtures by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:

1. Compressive Strength (28 Days): 5000 psi (34.5 MPa) minimum.

E. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to PCI MNL 117.

F. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.

G. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.

2.6 FABRICATION

A. Cast-in Anchors, Inserts, Plates, Angles, and Other Anchorage Hardware: Fabricate anchorage hardware with sufficient anchorage and embedment to comply with design requirements. Accurately position for attachment of loose hardware, and secure in place during precasting operations. Locate anchorage hardware where it does not affect position of main reinforcement or concrete placement.

1. Weld headed studs and deformed bar anchors used for anchorage according to AWS D1.1/D1.1M and AWS C5.4, "Recommended Practices for Stud Welding."

B. Furnish loose hardware items including steel plates, clip angles, seat angles, anchors, dowels, cramps, hangers, and other hardware shapes for securing architectural precast concrete units to supporting and adjacent construction.

C. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.

D. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.

E. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses.

F. Prestress tendons for architectural precast concrete units by either pretensioning or post-tensioning methods. Comply with PCI MNL 117.

G. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.

H. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch (25 mm) or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.

I. Place concrete in a continuous operation to prevent seams or planes of weakness from forming in precast concrete units.

1. Place backup concrete mixture to ensure bond with face-mixture concrete.

J. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air on surfaces. Use equipment and procedures complying with PCI MNL 117.

1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

K. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.

L. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that will not show in finished structure.

M. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.

N. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

2.7 FABRICATION TOLERANCES

A. Fabricate architectural precast concrete units straight and true to size and shape with exposed edges and corners precise and true so each finished panel complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

2.8 FINISHES

A. Panel faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved design reference sample and as follows:

1. Design Reference Sample: To match existing precast panels on existing building.

B. Finish exposed top surfaces of architectural precast concrete units to match face-surface finish.

C. Finish exposed top surfaces of architectural precast concrete units by smooth, steel-trowel finish.

D. Finish unexposed surfaces of architectural precast concrete units by float finish.

2.9 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants."

B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment as units are being permanently connected.

1. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
2. Unless otherwise indicated, provide for uniform joint widths of 3/4 inch (19 mm).

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

D. Welding: Comply with applicable AWS D1.1/D1.1M and AWS D1.4 for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

F. Grouting Connections: Grout connections where required or indicated. Retain grout in place until hard enough to support itself. Pack spaces with stiff grout material, tamping until voids are completely filled. Place grout to finish smooth, level, and plumb with adjacent concrete surfaces. Keep grouted joints damp for not less than 24 hours after initial set. Promptly remove grout material from exposed surfaces before it affects finishes or hardens.

G. Erect architectural precast concrete units level, plumb, square, true, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 117, Appendix I.

3.2 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections and prepare reports:

1. Erection of precast concrete members.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Field welds will be subject to visual inspections and nondestructive testing according to ASTM E 165 or ASTM E 709. High-strength bolted connections will be subject to inspections.

D. Testing agency will report test results promptly and in writing to Contractor and Architect.

E. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

F. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.3 REPAIRS

A. Repair damaged architectural precast concrete units if permitted by Architect. The Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet (6 m).

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.4 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Clean soiled precast concrete surfaces with detergent and water, using stiff fiber brushes and sponges, and rinse with clean water. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes unit masonry assemblies:

1. The Owner will engage an Independent Testing and Inspection Agency to verify the adequacy of the Contractor's quality control; to comply with the requirements of the International Building Code, 2003 ed. for Controlled Inspections for reinforced masonry.

1.2 PERFORMANCE REQUIREMENTS

A. Where reinforced concrete unit masonry walls are indicated provide unit masonry that develops an installed compressive strength (f'm) of 2,000 psi at 28 days, unless more stringent requirements are indicated on the structural drawings.

1.3 SUBMITTALS

A. Product Data: Submit product data for each masonry unit, accessory, and other manufactured product specified.

B. Shop Drawings: Submit, with copies to the Owner's Independent Testing and Inspection Agency, shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.

1. Show elevations of reinforced walls.

C. Samples: Submit samples of the specified colored mortars and decorative concrete masonry units.

D. Material Certificates: Submit, with copies to the Owner's Independent Testing and Inspection Agency, material certificates for the following, signed by the manufacturer and the Contractor. Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards.

1. Each type of concrete masonry unit.
2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Grout mixes. Include description of type and proportions of ingredients.
4. Each material and grade indicated for reinforcing bars.
5. Each type and size of joint reinforcement.
6. Each type and size of anchors, ties, and metal accessory.

E. Mix Designs: Submit material test reports, with copies to the Owner's Independent Testing and Inspection Agency, indicating and interpreting test results relative to compliance of the following proposed masonry materials with requirements.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.

2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

F. Statement of Compressive Strength of Masonry: Submit, with copies to the Owner's Independent Testing and Inspection Agency, statement of compressive masonry strength for each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

G. Cold-Weather Procedures: Submit, with copies to the Owner's Independent Testing and Inspection Agency, detailed description of methods, materials, and equipment to be used to comply with cold-weather requirements.

H. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

   a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

   a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

A. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards conflict the more stringent shall apply and where a conflict between any stated standard and a project specific requirement of the specifications arise the more stringent provision shall prevail.

1. National Concrete Masonry Association (NCMA):

   a. "TEK" Information Series.

   b. TEK 19-1 “Water Repellents for Concrete Masonry Walls.”

c. TEK 19-2A “Design for Dry Single Wythe Concrete Masonry Walls.”

d. TEK 19-4A “Flashing Strategies for Concrete Masonry Walls.”

e. TEK 19-5A “Flashing Details for Concrete Masonry Walls.”

2. American Concrete Institute (ACI):

a. ACI 530.1/ASCE 6 "Specifications for Masonry Structures."

b. ACI 530/ASCE 5 "Building Code Requirements for Masonry Structures."

3. Underwriters Laboratories, Inc. (UL) "Fire Resistance Ratings.”

4. International Building Code, 2003 ed., Reference Standard RS-10 “Structural Work”.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Owner’s Independent Testing and Inspection Agency:

1. General: The Owner will engage a qualified independent testing and inspection agency to perform Controlled Inspections for reinforced and non-reinforced masonry as required by the International Building Code, 2003 ed. for source and field quality assurance. Payment for these services will be made by Owner.

2. The Contractor is responsible for the expense of testing or inspection resulting as a consequence of the following:

a. Work not evidencing compliance with this specification.

b. Testing to verify the adequacy of work done without prior notice, improper supervision, or contrary to standard construction practice.

3. Contractor's Responsibilities:

a. Furnish casual labor required to facilitate testing.

b. Provide materials, samples and access to materials as required for testing.

c. Provide a complete set of shop and erection drawings, including revisions to previous Architect reviewed submittals.

4. Owner's Independent Testing and Inspection Agency's Duties:

a. The Owner's Independent Testing and Inspection Agency shall conduct the following tests and inspections, interpret them, evaluate the results for compliance

with the specifications, and report the findings to the Architect, Owner, Contractor, and Local Building Authority, as their interests may appear.

1) Inspection and testing shall be in accordance with ACI requirements for masonry (ACI 530 and ACI 503.1), the applicable provisions of Title 27, Construction and Maintenance, Chapter 1 Building Code, Subchapter 10 Structural Work, Tables 10-1 and 10-2, and Reference Standard RS-10. In addition provide the following inspections:

a) Observation, and placing of masonry units used in all reinforced masonry construction.

b) Inspection reports during reinforced masonry erection.

c) Observations of reinforcement condition, size and placement for compliance with ACI 530.

d) Ambient temperature during reinforced masonry erection.

e) Inspection of reinforced masonry materials to verify compliance with ACI 530.1.

f) Prism testing of masonry.

g) Observation of proportioning, mixing, consistency of mortar and grout for compliance with ACI 530.1.

h) Observation of application of mortar, grout and masonry units for compliance with ACI 530.1.

i) Observation of installation of anchors for compliance with ACI 530.

b. Tests shall be conducted at the start of the job, using materials and mixes sampled at point of deposit.

c. Field Tests of Concrete Masonry Design Strength: During construction, the value of the compressive concrete masonry design strength (f'm) shall be verified by field tests in accordance with the ACI and ASTM standards. A minimum of one field test shall be made for every 5000 square feet of reinforced CMU wall. Not less than three prisms shall be made for each field test. The thickness of the prisms shall be taken as 8 inches for the reinforced CMU.

E. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

F. Mock-Ups for Decorative Concrete Masonry: Build mock-ups to verify selections made under sample submittals and to demonstrate aesthetic effects.

1. Build mock-ups for typical exterior wall constructed of decorative masonry units in sizes approximately 60 inches (1500 mm) long by 48 inches (1200 mm) high by full thickness.

2. Include a sealant-filled joint at least 16 inches (400 mm) long in exterior wall mockup.

3. Include sealer treatment to the entire weather exposed surface of the exterior wall mockup.

4. Protect approved mock-ups from the elements with weather-resistant membrane. Approval of mock-ups is for color, texture, pattern, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless such deviations are specifically approved by the Architect in writing.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 section “Project Management and Coordination”. Prior to the start of each major type of masonry work, and at the Contractor's direction, meet at the site and review the installation procedures and coordination with other work. Meeting shall include Contractor, Architect, mason, metal fabrications installer, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the masonry work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

1. Deliver decorative concrete masonry units to the jobsite on covered banded pallets with cardboard between layers. Store pallets in single stacks on level ground and cover with waterproof covering to protect the units form inclement weather. Handle decorative concrete masonry units carefully to avoid breakage and damage to the finished surfaces.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.6 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least 3 days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

2.2 CONCRETE MASONRY UNITS (CMU's)

A. General: Comply with requirements indicated below applicable to each form of concrete masonry unit required.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.

2. Provide square-edged units for outside corners, unless otherwise indicated.

B. Concrete Masonry Units (Typical non-decorative units and wherever interior, non-weather exposed, concrete masonry is indicated or required: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as required to produce installed concrete unit masonry compressive strength (f'm) as specified.

2. Weight Classification: Normal weight, unless otherwise indicated.

3. Size: Manufactured to dimensions 3/8 inch less than nominal dimensions.

C. Decorative Concrete Masonry Units (GF-01): ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength as required to produce installed concrete unit masonry compressive strength (f'm) as indicated on the structural drawings.

2. Integral Water Repellent: Provide decorative concrete masonry units made with integral water repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive according to ASTM E 514, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen. (Product Reference: Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block).

3. Weight Classification: Normal weight.

4. Size (Actual Dimensions):

a. Field Units: 7-5/8" high x 15-5/8" long x 7-9/16" deep.

b. Shapes: Manufactured to dimensions 3/8" less than nominal dimensions.

5. Pattern, Texture and Finish:

a. Manufacturer and Product: see finish schedule

b. Texture: One face, facing exterior, to be ground.

c. Finish: Omit factory applied heat treated acrylic finish and provide field applied sealer.

6. Colors: See finish schedule

2.3 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I/II. Provide natural color or white cement as required to produce mortar color indicated at decorative masonry work.

B. Hydrated Lime: ASTM C 207.

C. Mortar Pigments (Decorative Concrete Masonry Only): Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

D. Aggregate for Mortar: ASTM C 144, sand.

1. For mortar that is exposed to view at decorative concrete masonry, use washed aggregate consisting of natural sand or crushed stone.

E. Aggregate for Grout: ASTM C 404.

F. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.

G. Water: Potable.

2.4 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951.

1. Finish and Metal: Hot-dip galvanized, carbon steel. Hot dip galvanize reinforcement after fabrication with a minimum coating of 1.5 ounces per square foot in accordance with ASTM A153.
2. Wire Size for Side and Cross Rods: 9 gage (W1.7 or 0.148-inch (3.8-mm) diameter), unless otherwise indicated on the drawings.
3. Spacing of Cross Rods: Not more than 16 inches (407 mm) o.c.
4. Provide in lengths of not less than 10 feet (3 m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Provide ladder design with perpendicular cross rods, and a single pair of side rods. Out to out spacing of side rods of between 1-1/2" to 2" less than nominal wall dimension.

1. Deformed Wire Specification: One set of deformations shall occur around the perimeter of the wire at a maximum spacing of 0.7 times the diameter of the wire but not less than 8 sets per 1" of length. The overall length of each deformation within the set shall be such

that the summation of gaps between the ends of the deformations shall not exceed 25% of the perimeter of the wire. The indentation depth, or height, of the deformations shall be 0.009".

2.5 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; minimum diameter 0.1496" (Wire Designation W1.7) hot dip galvanized after fabrication with a minimum coating of 1.5 ounces per square foot in accordance with ASTM A 153/A 153M.
2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M, Class B2 (for unit lengths over 15") and Class B3 (for unit lengths under 15"), for sheet metal ties and anchors.

    a. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet hot dip galvanized after fabrication shall be 12 gage.

3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M, galvanized.

B. Adjustable Anchors for Connecting Masonry to Structure: Two-piece assemblies as described below allowing vertical or horizontal differential movement between wall and framework parallel to plane of wall, but resisting tension and compression forces perpendicular to it. Corrugated straps shall not be permitted.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.
2. Tie Section for Steel Frame: Triangular-shaped wire tie, sized to extend within 1 inch (25 mm) of masonry face, made from 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.

C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches (38 mm) wide by 1/4 inch (6.4 mm) thick by 24 inches (600 mm) long, with ends turned up 2 inches (50 mm), unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.6 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM F1554, Grade 36; with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

B. Postinstalled Anchors: Provide chemical anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection for Interior Exposures: Carbon-steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (5 microns) for Class SC 1 service condition (mild).

2. Corrosion Protection for Exterior Exposures: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group 1 or 4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

2.7 EMBEDDED FLASHING MATERIALS

A. Sheet-Metal Flashing: Installed by Section 04 22 09. Refer to Section 07 62 00 "Sheet Metal Flashing and Trim" for product requirements.

2.8 MISCELLANEOUS MASONRY ACCESSORIES

A. Steel Lintels: Installed by Section 04 22 09. Refer to Section 05500 “Metal Fabrications.” for product requirements

B. Compressible Filler: Premolded closed cell neoprene filler strips with peel off pressure sensitive adhesive one side, complying with ASTM D 1056, Type 2, Class A, Grade 1; minimum 2-3/4" wide, and having a minimum 50% compressibility.

C. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

D. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

E. Sealants and Joint Fillers: Refer to Section 07 92 00 “Joint Sealants.”

F. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch (3.6-mm) steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

G. Field Applied Sealer: Specially-formulated, VOC-compliant, clear, penetrating sealer consisting of water-based blend of silanes and siloxanes to provide maximum water-repellency when post-applied to integrally water-repellent-treated CMU wall construction. Other physical properties required for the sealer shall include:

1. Water Permeance: Class E Rating when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514-74.

2. Moisture Vapor Transmission Rate: Minimum 95% compared to unsealed normal weight integral water-repellent sample per ASTM E 96.

3. Depth of Penetration: Between 15 mm (9⁄16 in.) to 35 mm (13⁄8 in.) as observed visually.

4. Accelerated Weathering: Minimal color change using QUV for 2,000 hours.

5. Product Reference: Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Infiniseal DB Water Repellent Sealer.

2.9 MASONRY-CELL INSULATION

A. Molded-Polystyrene Insulation Units (Required at all Exterior Walls): Rigid, cellular thermal insulation formed by the expansion of polystyrene-resin beads or granules in a closed mold to comply with ASTM C 578, Type I. Provide specially shaped units designed for installing into cells of concrete masonry units and which will yield a minimum R-value of 5 when inserted into an nominal 8” thick concrete masonry unit.

2.10 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.
3. Limit water repellent admixture material in mortar to proportions recommended by the admixture manufacturer for the conditions indicated.

B. Mortar for Unit Masonry: Comply with ASTM C 270 Proportion Specification. Provide the following type of mortar for all applications unless another type is indicated in the structural drawings, premixed mortars will not be permitted:

1. Type S as required by the International Building Code, 2003 ed.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches (200 to 280 mm) as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Verify that reinforcing dowels are properly placed.
2. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

3.2 INSTALLATION, GENERAL

A. Comply with ACI 530.1/ASCE 6, ACI 530/ASCE 5 and other requirements indicated applicable to each type of installation included in Project.

B. Thickness: Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

C. Build chases and recesses to accommodate items specified in this and other Sections.

D. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

E. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

F. No open celled units will be permitted in exposed masonry.

G. Select and arrange units for exposed decorative masonry units to produce a uniform blend of colors and textures.

1. Mix units from several pallets as they are placed.

H. Do not use chipped, cracked, broken, stained, or otherwise damaged units. Do not use units with voids.

I. Erection Tolerances: Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet (6 mm in 3 m), or 1/2 inch (12 mm) maximum.
3. For conspicuous horizontal lines, such as lintels, sills, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 1/2 inch (12 mm) maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch (3 mm).
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch (3 mm).
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs.

B. Lay up walls to comply with specified erection tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry:

1. Non-Decorative CMU: Lay exposed non-decorative CMU masonry in running bond pattern unless otherwise indicated; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
2. Decorative CMU: Lay exposed masonry in running bond pattern unless otherwise indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches (100-mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar.

F. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

1. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

2. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core cell. Each cell shall be solidly filled with mortar or grout after rodding.

3. At the course of concrete masonry units immediately below all openings (i.e. louvers) provide solid units or solid grout cores where expansion anchors or provisions of other work requires.

4. Set units with care around frames so as not to bulge the sides or change the position of the frames. Break joints in units around the tops of door frames so as to minimize the danger of loosening the units due to door jarring. Set units tightly against metal frames and fill voids completely. Build frame anchors into joints. Cut units accurately to fit around pipes, ducts, and openings, and fill voids full. Fill jambs and head of hollow metal frames solid with mortar.

5. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

G. All courses of exposed masonry work shall be lined up so as to result in a uniform appearance.

H. Build non-load-bearing interior partitions full height of story to underside of floor/roof slabs and decks and other continuous solid structural surfaces, cut and place masonry units to fit around structural and other members extending below floor/roof slabs and decks.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

I. Holes made in exposed units for attachment of handrail brackets, boxes, hose bibs, Siamese connections, electrical boxes, lighting fixtures, security devices, and similar items shall be neatly drilled. Provide special jamb, irregular and regular angle units where required to obtain smooth, evenly jointed and regular patterns throughout exposed surfaces. Provide solid units or solid grout cores where expansion anchors and provisions of other work requires.

3.4 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
5. Maintain 3/8 inch head and bed joint widths for all masonry work. Cut joints flush for masonry walls to be concealed or to be covered by other materials.
6. Do not block cells of concrete masonry units indicated to be filled with grout or masonry cell insulation.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness, unless otherwise indicated.

3.5 MASONRY-CELL INSULATION

A. Install molded-polystyrene insulation units into masonry unit cells before laying units. Do not place insulation units into cells indicated to receive vertical reinforcing and grout.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Provide continuous horizontal joint reinforcement spaced not more than 16 inches (406 mm) o.c. vertically.
2. Provide reinforcement as indicated on the structural drawings.

B. Interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units. Provide continuity at corners by using prefabricated L-shaped units.

D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:

1. Provide an open space not less than 1/2 inch (13 mm) in width between masonry and structural member, unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry to structural members with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches (610 mm) o.c. vertically and 36 inches (915 mm) o.c. horizontally.
4. At concrete masonry for exterior walls anchor masonry to slabs with anchorage placed into slab and embedded into masonry cells as indicated on the drawings.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joints in unit masonry to provide an unbroken vertical separation through all single wythe masonry walls, at locations indicated. Where locations are not shown, construct control joints throughout the unbroken length of walls at approximately 25' 0" centers. Also, place control joints at points of natural weakness in the masonry work, including the following locations:

1. Above and below major openings, at one jamb if opening is less than 6'-0" wide and at both jambs if opening is over 6'-0" wide.
2. At vertical chases, recesses and other points of reduction in wall thickness.
3. At locations where masonry wall height changes by more than 20 percent.
4. Above expansion, construction or control joints in the supporting structure.
5. Where end of masonry wall butts against supporting structure.
6. At return angles in “L”, “T”, and “U” shaped intersections.

B. Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

C. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.

D. Build in horizontal pressure relieving joints where indicated; construct joints by inserting nonmetallic 50 percent compressible joint filler of width required to permit installation of sealant and backer rod specified in Section 07920 'Joint Sealants.'

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide masonry lintels with reinforcing bars and mortar fill, where shown and where openings in concrete masonry of more than 12 inches (305 mm) for brick-size units and 24 inches (610 mm) for block-size units are shown without structural steel or other supporting lintels. Provide reinforcing bars and coarse grout fill as prescribed by NCMA TEK 17-2A where bar sizes and spacing are not indicated.

C. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.

3.10 FLASHING

A. General: Install embedded flashing in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.

B. Install flashing as follows, unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar.

2. Starting with a downward sloping drip edge protruding from the outside face of wall extend flashing completely through the single wythe wall and turn up flashing approximately 3 inches on the interior face of exterior wall where CMU units are exposed and where CMU units are to be concealed by furring or framing unless otherwise indicated. Leave a ¼" gap between the ends of continuous lengths of metal flashing to allow for thermal expansion of the flashing.

a. Starting at the top of the metal flashing at the interior face of the wall and running continuously to the top of the break in the drip edge, apply a single piece strip of self adhering rubberized asphalt flashing fully bonded to the metal flashing and lapping a minimum of 4" onto each side of the ¼" gap to prevent moisture from entering the gap.

b. Roll the flexible flashing with a squeegee or wooden roller to obtain 100% contact to the metal flashing substrate and to remove bubbles, fishmouths, air pockets, and creases.

3. At lintels and shelf angles, extend flashing a minimum of 6 inches (150 mm) into masonry at each end. At heads and sills, extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams. Solder end dam joints.

4. Before covering with cavity filter, grout or mortar, seal penetrations in flashing, such as required at vertical reinforcing bars for concrete masonry reinforcement, with butyl sealant.

C. Install weep holes in exterior face of single wythe exterior walls located in the first course of masonry immediately above embedded flashing and as follows:

1. Use partially open head joints to form weep holes.
2. Space weep holes 24 inches (600 mm) o.c.

D. Place pea gravel cavity filter in masonry unit cell cavities as soon as practical to a height equal to height of first course above top of through wall flashing, but not less than 2 inches (50 mm), to maintain drainage.

3.11 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

1. Place vertical reinforcing at intervals shown before grouting. Place before or after laying masonry units, as required by job conditions. Support vertical reinforcing at intervals indicated. Where individual bars are placed after laying masonry, place wire loops extending into cells as masonry is laid and loosen before mortar sets. After insertion of reinforcing bar, pull loops and bar to proper position and tie free ends.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.

2. Prior to grouting, clean and inspect grout spaces. Remove dust, dirt, mortar droppings, loose pieces of masonry and other foreign materials from grout spaces. Clean reinforcing and adjust to proper positioning as required. Clean top surface of structural members supporting masonry to ensure bond. After final cleaning and inspection, close cleanout holes and brace closures as required to resist grout pressures.

3. Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist displacement of masonry units and breaking of mortar bond. Install shores and bracing, if required, before starting grouting operations.

4. Limit grout pours to sections which can be completed in one working day with not more than one hour interruption of pouring operation. Allow not less than 30 minutes, not more than one hour between lifts of a given pour. Rod or vibrate each grout lift during pouring operation.

5. When more than one pour is required to complete a given section of masonry, extend reinforcing beyond masonry as required for splicing. Pour grout to within 1-1/2" of top course of first pour. After grouted masonry is cured, lay masonry units and place reinforcing for second pour section before grouting. Repeat sequence if more pours are required.

3.12 POINTING AND CLEANING

A. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
3. Clean decorative masonry units in accordance with decorative masonry unit manufacturers printed instructions.

3.13 FIELD APPLIED WATER REPELLENT SEALER APPLICATION

A. Surface Preparation:

1. Ensure surface area of CMU to be treated is clean and dry, free of chemical cleaners, efflorescence, dirt, oils, mortar smears, and other surface contaminants.

2. Repoint loose, cracked, or disintegrated mortar a minimum of 7 days before applying water-repellent sealer.

3. Ensure joint sealants and caulkings are fully cured.

B. Surrounding Area Protection:

1. Take precautions to protect all areas surrounding surfaces to be treated with water-repellent sealer, including masking windows and metals, and covering and other non-CMU surfaces with either polyethylene sheeting or drop cloth materials before and during sealer application.

2. Take safety precautions to keep all personnel not involved in application of water-repellent sealer and pedestrians away from application area.

3. Avoid overspray by wind drift and/or improper application procedures.

C. VOC-Compliant Water-Repellent Sealer:

1. Pre-Application Testing: Perform application test to 1.5 m x 1.5 m (5 ft x 5 ft) section of CMU wall surface to determine:

a. Proper sealer coverage rate for type of CMU being sealed. Typical sealer coverage rate ranges from 1.2 to 3.7 m2/L (50 to 150 ft2/gal). Where overall coverage rates are less than 1.9 m2/L (80 ft2/gal), use 2-coat application method.

b. Desired water-repellency properties.

c. Desired surface appearance after sealer is fully dry.

2. Spray Application:

a. Use low-pressure airless spray equipment fitted with fan tip between 0.6 mm (0.025 in.) and 0.8 mm (0.035 in.).

b. Apply at lowest pressure setting that ensures continuous spray without surge.

c. Using 0.9 m to 1.2 m (3 ft to 4 ft) wide swathes, start spraying from bottom of CMU wall and work to top of wall, avoiding spray atomization and applying sufficient material to saturate CMU wall with maximum 150 mm (6 in.) sealer rundown.

d. Apply second coat, wet-on-wet, at twice the coverage rate as first coat within one hour of first spray application, per pre-application testing to ensure proper surface saturation, coverage, and product performance.

3. Cleaning:

a. Clean all equipment with hot, soapy water.

b. Clean all windows or surrounding areas accidentally oversprayed on same day of application using warm, soapy water.

c. If overspray is allowed to dry, clean surface with solvents such as mineral spirits or typical scraping methods.

3.14 MASONRY WASTE DISPOSAL

A. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00

SECTION 04 42 00 - EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of dimension stone:

1. Panels set with individual anchors.

B. See Division 03 Section "Precast Architectural Concrete" for setting dimension stone panels in architectural precast concrete units.

C. See Division 08 Section "Glazed Aluminum Curtain Walls" for installing dimension stone panels in aluminum curtain-wall systems.

D. Allowances: Furnish preconstruction testing under the Inspection and Testing Allowance as specified in Division 01 Section "Allowances."

1.2 PERFORMANCE REQUIREMENTS

A. General: Design stone anchors and anchoring systems according to ASTM C 1242.

B. Structural Performance: Provide dimension stone cladding system capable of withstanding the effects of gravity loads.

1.3 SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and other manufactured products indicated.

B. Shop Drawings: Show fabrication and installation details for dimension stone cladding system, including dimensions and profiles of stone units.

1. Show locations and details of joints both within dimension stone cladding system and between dimension stone cladding system and other construction.
2. Show locations and details of anchors and backup structure.

C. Stone Samples: Sets for each color, grade, finish, and variety of stone required; not less than 12 inches (300 mm) square.

D. Colored Pointing Mortar Samples: For each color required.

E. Sealant Samples: For each type and color of joint sealant required.

F. Material Test Reports: From a qualified independent testing agency, as follows:

1. Stone Test Reports: For each stone variety proposed for use on Project, provide test data indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous five years.

G. LEED Submittals:

1. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Source Limitations for Stone: Obtain each variety of stone, regardless of finish, from a single quarry.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of typical exterior wall with dimension stone cladding, approximately 36 inches long by 18 inches high

1.5 PROJECT CONDITIONS

A. Environmental Limitations for Mortar: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace dimension stone cladding damaged by frost or freezing conditions. Comply with cold- and hot-weather construction and protection requirements for masonry contained in ACI 530.1/ASCE 6/TMS 602.

B. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F (5 deg C) or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 GRANITE (ST-01)

A. Granite: Comply with ASTM C 615.

B. Available Varieties and Sources: Subject to compliance with requirements, stone varieties that may be incorporated into the Work include, but are not limited to, the following:

C. Varieties and Sources: Subject to compliance with requirements, provide the following:

1. Swenson Granite Works, Woodbury Gray or equal.

D. Finish: Honed-Match Architect's sample.

E. Match Architect's samples for stone characteristics relating to aesthetic effects.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Low-Alkali Cement: Portland cement for use with limestone shall contain not more than 0.60 percent total alkali when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207.

C. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch (6 mm), use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.

D. Mortar Pigments: Natural and synthetic iron oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in mortar and containing no carbon black.

E. Water: Potable.

2.3 ANCHORS AND BACKUP STRUCTURE

A. Fabricate anchors from stainless steel, ASTM A 666, Type 316. Fabricate dowels and pins from stainless steel, ASTM A 276, Type 316.

B. Postinstalled Anchor Bolts for Concrete and Masonry: torque-controlled expansion anchors or undercut anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group A1 or A4) for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

C. Threaded Fasteners:

1. For stainless steel, use stainless-steel bolts, nuts, and washers; ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group A1 or A4).

2.4 STONE ACCESSORIES

A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.

B. Concealed Sheet Metal Flashing: Fabricate from stainless steel in thicknesses indicated, but not less than 0.0156 inch (0.4 mm) thick. Comply with requirements specified in Division 07 Section "Sheet Metal Flashing and Trim."

C. Weep and Vent Tubes: Medium-density polyethylene tubing, 1/4-inch (6-mm) OD and of length required to extend from exterior face of stone to cavity behind.

D. Sealant for Filling Kerfs: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Division 07 Section "Joint Sealants" and that do not stain stone.

2.5 STONE FABRICATION

A. Control depth of stone and back check to maintain minimum clearance of 1 inch (25 mm) between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.

B. Dress joints (bed and vertical) straight and at right angle to face, unless otherwise indicated.

C. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.

D. Cut stone to produce uniform joints 3/8 inch (10 mm) wide and in locations indicated.

E. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.

2.6 MORTAR MIXES

A. General: Comply with referenced standards and with manufacturers' written instructions. Do not use admixtures, unless otherwise indicated.

B. Portland Cement-Lime Setting Mortar: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:

1. Set granite with Type S mortar.

PART 3 - EXECUTION

3.1 SETTING DIMENSION STONE CLADDING, GENERAL

A. Coat limestone with dampproofing to extent indicated below:

1. Stone at Grade: Beds, joints, and back surfaces to at least 12 inches (300 mm) above finish-grade elevations.
2. Stone Extending below Grade: Beds, joints, back surfaces, and face surfaces below grade.

B. Parge back side of travertine panels with mortar not less than 3/8 inch (10 mm) thick.

C. Execute dimension stone cladding installation by skilled mechanics and employ skilled stone fitters to do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone.

D. Set stone to comply with requirements indicated on Drawings and Shop Drawings. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure dimension stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated with uniform joints of widths indicated and with edges and faces aligned according to established relationships and indicated tolerances.

E. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.

1. Sealing expansion and other joints is specified in Division 07 Section "Joint Sealants."
2. Keep expansion joints free of mortar and other rigid materials.

F. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water to divert water to building exterior.

G. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.

1. Place weep holes in joints where moisture may accumulate, including base of cavity walls, above shelf angles, and flashing. Locate weep holes at intervals not exceeding 24 inches (600 mm).
2. Place vents in cavity walls at tops of cavities, below shelf angles and flashing, and at intervals not exceeding 20 feet (6 m) vertically. Locate vents in joints at intervals not exceeding 60 inches (1500 mm) horizontally.

3.2 SETTING MECHANICALLY ANCHORED DIMENSION STONE CLADDING

A. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.

B. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.

C. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.3 JOINT-SEALANT INSTALLATION

A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Division 07 Section "Joint Sealants."

3.4 INSTALLATION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet (6 mm in 3 m) or 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, corners and jambs within 20 feet (6 m) of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 3/8 inch in 40 feet (10 mm in 12 m) or more.

B. Variation from Level: For lintels, sills, parapets, horizontal bands, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m) or 3/8 inch (10 mm) maximum.

C. Variation of Linear Building Line: For positions shown in plan, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (12 mm in 12 m) or more.

D. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less.

E. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units.

3.5 ADJUSTING AND CLEANING

A. In-Progress Cleaning: Clean dimension stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.

B. Final Cleaning: Clean dimension stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 04 42 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

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. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Architecturally Exposed Structural Steel Framing" for additional requirements for architecturally exposed structural steel.
3. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
4. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other metal items not defined as structural steel.
5. Division 05 Section "Metal Stairs."
6. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for surface-preparation and priming requirements.
7. Division 13 Section "Metal Building Systems" for structural steel.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.

C. Heavy Sections: Rolled and built-up sections as follows:

1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
2. Welded built-up members with plates thicker than 2 inches.
3. Column base plates thicker than 2 inches.

D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.

E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering design by a qualified professional engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using schematic details indicated and AISC 360.
2. Use LRFD; data are given at factored-load level.

B. Moment Connections: Type FR, fully restrained.

C. Construction: Moment frame.

1.5 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

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

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.
8. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand critical welds.

E. Qualification Data: For qualified Installer, fabricator professional engineer and testing agency.

F. Welding certificates.

G. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

H. Mill test reports for structural steel, including chemical and physical properties.

I. Product Test Reports: For the following:

1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

J. Source quality-control reports.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P2 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

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

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 341 and AISC 341s1.

3. AISC 360.
4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

F. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

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

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.8 COORDINATION

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

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

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 50 percent.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:

1. W-Shapes: 60 percent.
2. Channels, Angles: 60 percent.
3. Plate and Bar: 25 percent.

4. Cold-Formed Hollow Structural Sections: 25 percent.
5. Steel Pipe: 25 percent.
6. All Other Steel Materials: 25 percent.

C. W-Shapes: ASTM A 992/A 992M.

D. Channels, Angles: ASTM A 36/A 36M.

E. Plate and Bar: ASTM A 36/A 36M.

F. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50.

G. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

H. Corrosion-Resisting Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.

I. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.

1. Weight Class: Standard.
2. Finish: Black except where indicated to be galvanized.

J. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.

K. Steel Forgings: ASTM A 668/A 668M.

L. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.

B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.

1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.

C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.

2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.

D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hex head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

F. Unheaded Anchor Rods: ASTM F 1554, Grade 55, weldable.

1. Configuration: Straight.
2. Nuts: ASTM A 563 heavy-hex carbon steel.
3. Plate Washers: ASTM A 36/A 36M carbon steel.
4. Washers: ASTM F 436, Type 1, hardened carbon steel.
5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

G. Headed Anchor Rods: ASTM F 1554, Grade 55, weldable, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436, Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

H. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.

J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.3 PRIMER

A. Primer: Comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

B. Primer: primer shall conform to the following criteria:

1. TNEMEC Series 394 applied at 2.5-3.5 mils DFT is used as standard of quality and performance. Equals by Dupont or Hempel will be considered.

C. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.

B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

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

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

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

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

C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 3, "Power Tool Cleaning."

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

G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wall-opening framing to be attached to structural steel. Straighten as required to provide uniform, square, and true members in completed wall framing.

H. Welded Door Frames: Build up welded door frames attached to structural steel. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.

I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

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

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

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

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2. Steel primer shall conform to the following criteria:

a. TNEMEC Series 394 applied at 2.5-3.5 mils DFT is used as standard of quality and performance. Equals by Dupont or Hempel will be considered.

3. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels, shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.

2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

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

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

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

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

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.

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

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

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

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

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:

1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

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

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

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

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

END OF SECTION 05 12 00

SECTION 05 12 13 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

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 architecturally exposed structural-steel framing.

1. Requirements in Division 05 Section "Structural Steel Framing" also apply to AESS framing.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Structural Steel Framing" for additional requirements applicable to AESS.
3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications and other metal items not defined as structural steel.
4. Division 05 Section "Metal Stairs."
5. Division 09 painting Sections and Division 09 Section "High-Performance Coatings" for surface preparation and priming requirements.

1.3 DEFINITIONS

A. Architecturally Exposed Structural Steel: Structural steel designated as "architecturally exposed structural steel" or "AESS" in the Contract Documents.

B. Category 1 AESS: AESS that is within 96 inches vertically and 36 inches horizontally of a walking surface and is visible to a person standing on that walking surface or is designated as "Category 1 architecturally exposed structural steel" or "AESS-1" in the Contract Documents.

C. Category 2 AESS: AESS that is within 20 feet vertically and horizontally of a walking surface and is visible to a person standing on that walking surface or is designated as "Category 2 architecturally exposed structural steel" or "AESS-2" in the Contract Documents.

D. Category 3 AESS: AESS that is not defined as Category 1 or Category 2 or that is designated as "Category 3 architecturally exposed structural steel" or "AESS-3" in the Contract Documents.

1.4 SUBMITTALS

A. Shop Drawings: Show fabrication of AESS components. Shop Drawings for structural steel may be used for AESS provided items of AESS are specifically identified and requirements below are met for AESS.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain. Indicate grinding, finish, and profile of welds.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections. Indicate orientation of bolt heads.
5. Indicate exposed surfaces and edges and surface preparation being used.
6. Indicate special tolerances and erection requirements.

B. Samples: Submit samples of AESS to set quality standards for exposed welds for Category 1 AESS.

1. Two steel plates, 3/8 by 8 by 4 inches, with long edges joined by a groove weld and with weld ground smooth.
2. Steel plate, 3/8 by 8 by 8 inches, with one end of a short length of rectangular steel tube, 4 by 6 by 3/8 inches, welded to plate with a continuous fillet weld and with weld ground smooth and blended.
3. Round steel tube or pipe, minimum 8 inches in diameter, with end of another round steel tube or pipe, approximately 4 inches in diameter, welded to its side at a 45-degree angle with a continuous fillet weld and with weld ground smooth and blended.

C. Qualification Data: For qualified Installer and fabricator.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

B. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P2 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."

D. Mockups: Build mockups of AESS to set quality standards for fabrication and installation.

1. Build mockup of typical portion of AESS as shown on Drawings.
2. Coordinate finish painting requirements with Division 09 painting Sections.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

E. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Use special care in handling to prevent twisting, warping, nicking, and other damage. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

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

1.7 PROJECT CONDITIONS

A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

1.8 COORDINATION

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

PART 2 - PRODUCTS

2.1 BOLTS, CONNECTORS, AND ANCHORS

A. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round-head assemblies, consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.

1. Finish: Plain.

2.2 PRIMER

A. Primer: Comply with Division 09 painting Sections and Division 09 Section "High-Performance Coatings."

B. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.

D. Galvanizing Repair Paint: ASTM A 780.

2.3 FABRICATION

A. Shop fabricate and assemble AESS to the maximum extent possible. Locate field joints at concealed locations if possible. Detail assemblies to minimize handling and to expedite erection.

B. In addition to special care used to handle and fabricate AESS, comply with the following:

1. Fabricate with exposed surfaces smooth, square, and free of surface blemishes including pitting, rust, scale, and roughness.
2. Grind sheared, punched, and flame-cut edges of Category 1 AESS to remove burrs and provide smooth surfaces and edges.
3. Fabricate Category 1 AESS with exposed surfaces free of mill marks, including rolled trade names and stamped or raised identification.
4. Fabricate Category 1 and Category 2 AESS with exposed surfaces free of seams to maximum extent possible.
5. Remove blemishes by filling or grinding or by welding and grinding, before cleaning, treating, and shop priming.
6. Fabricate with piece marks fully hidden in the completed structure or made with media that permits full removal after erection.
7. Fabricate Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
8. Fabricate Category 2 and Category 3 AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.
9. Seal-weld open ends of hollow structural sections with 3/8-inch closure plates for Category 1 AESS.

C. Curved Members: Fabricate indicated members to curved shape by rolling to final shape in fabrication shop.

1. Distortion of webs, stems, outstanding flanges, and legs of angles shall not be visible from a distance of 20 feet under any lighting conditions.
2. Tolerances for walls of hollow steel sections after rolling shall be approximately 1/2 inch.

D. Coping, Blocking, and Joint Gaps: Maintain uniform gaps of 1/8 inch with a tolerance of 1/32 inch for Category 1 AESS.

E. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.

F. Cleaning Corrosion-Resisting Structural Steel: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

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

2.4 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work, and comply with the following:

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding specified tolerances.
2. Use weld sizes, fabrication sequence, and equipment for AESS that limit distortions to allowable tolerances.
3. Provide continuous, sealed welds at angle to gusset-plate connections and similar locations where Category 1 AESS is exposed to weather.
4. Provide continuous welds of uniform size and profile where Category 1 AESS is welded.
5. Grind butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for Category 1 and Category 2 AESS.
6. Make butt and groove welds flush to adjacent surfaces within tolerance of plus 1/16 inch, minus 0 inch for Category 1 and Category 2 AESS. Do not grind unless required for clearances or for fitting other components, or unless directed to correct unacceptable work.
7. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
8. At locations where welding on the far side of an exposed connection of Category 1 and Category 2 AESS occurs, grind distortions and marking of the steel to a smooth profile aligned with adjacent material.
9. Make fillet welds for Category 1 and Category2 AESS oversize and grind to uniform profile with smooth face and transition.
10. Make fillet welds for Category 1 and Category 2 AESS of uniform size and profile with exposed face smooth and slightly concave. Do not grind unless directed to correct unacceptable work.

2.5 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
2. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
3. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.6 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials.
5. Galvanized surfaces.

B. Surface Preparation for Nongalvanized Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-Off Blast Cleaning."
4. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
5. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
9. SSPC-SP 8, "Pickling."

C. Preparing Galvanized Steel for Shop Priming: After galvanizing, thoroughly clean steel of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner.

D. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

B. Examine AESS for twists, kinks, warping, gouges, and other imperfections before erecting.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep AESS secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. If possible, locate welded tabs for attaching temporary bracing and safety cabling where they will be concealed from view in the completed Work.
2. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set AESS accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

1. Erect Category 1 AESS to the tolerances specified in AISC 303 for steel that is designated AESS.
2. Erect Category 2 and Category 3 AESS to the tolerances specified in AISC 303 for steel that is not designated AESS.

B. Do not use thermal cutting during erection.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Orient bolt heads as indicated on Drawings.

B. Weld Connections: Comply with requirements in "Weld Connections" Paragraph in "Shop Connections" Article.

1. Remove backing bars or runoff tabs; back-gouge and grind steel smooth for Category 1 and Category 2 AESS.
2. Remove erection bolts in Category 1 and Category 2 AESS, fill holes, and grind smooth.
3. Fill weld access holes in Category 1 and Category 2 AESS and grind smooth.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect AESS as specified in Division 05 Section "Structural Steel Framing." The testing agency will not be responsible for enforcing requirements relating to aesthetic effect.

B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

3.6 REPAIRS AND PROTECTION

A. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Grind steel smooth.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

C. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

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

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

END OF SECTION 05 12 13

SECTION 05 31 00 - STEEL DECKING

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. Roof deck.
2. Composite floor deck.

B. Related Sections include the following:

1. Division 03 Section "Cast-in-Place Concrete" for concrete fill.
2. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.
4. Division 09 painting Sections for repair painting of primed deck.
5. Division 26 Section "Underfloor Raceways for Electrical Systems" for preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts used with cellular floor-deck systems.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. LEED Submittal:

1. Product Data for Credit MR 4.1: 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.

C. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

D. Product Certificates: For each type of steel deck, signed by product manufacturer.

E. Welding certificates.

F. Field quality-control test and inspection reports.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:

1. Power-actuated mechanical fasteners.
2. Acoustical roof deck.

H. Research/Evaluation Reports: For steel deck.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency qualified according to ASTM E 329 for testing indicated.

B. Source Limitations for Electrified Cellular Floor Deck: Obtain cellular floor-deck units and compatible electrical components, such as preset inserts, activation kits, afterset inserts, service fittings, header ducts, and trench header ducts, from same manufacturer.

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

D. Fire-Test-Response Characteristics: Where indicated, provide steel deck units identical to those tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations of applicable testing and inspecting agency.
2. Steel deck units shall be identified with appropriate markings of applicable testing and inspecting agency.

E. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

F. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

G. FMG Listing: Provide steel roof deck evaluated by FMG and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

H. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

1.6 COORDINATION

A. Coordinate installation of sound-absorbing insulation strips in topside ribs of acoustical deck with roofing installation specified in Division 07 Section "" to ensure protection of insulation strips against damage from effects of weather and other causes.

B. Coordinate layout and installation of trench headers, preset inserts, duct fittings, and other components specified in Division 26 Section "Underfloor Raceways for Electrical Systems" with installation of electrified cellular metal floor deck.

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:

1. Steel Deck:

a. ASC Profiles, Inc.
b. Canam Steel Corp.;The Canam Manac Group.
c. Consolidated Systems, Inc.
d. DACS, Inc.
e. D-Mac Industries Inc.
f. Epic Metals Corporation.
g. Marlyn Steel Decks, Inc.
h. New Millennium Building Systems, LLC.
i. Nucor Corp.; Vulcraft Division.
j. Roof Deck, Inc.
k. United Steel Deck, Inc.
l. Valley Joist; Division of EBSCO Industries, Inc.
m. Verco Manufacturing Co.
n. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

2.2 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Prime-Painted Steel Sheet: ASTM A 1008/A 1008M, Structural Steel (SS), Grade [**33**] [**40**] [**80**] minimum, shop primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: [**Manufacturer's standard**] [**Gray**] [**White**] [**Gray top surface with white underside**].

2. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade [**33**] [**40**] [**80**], [**G60**] [**G90**] zinc coating.
3. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade [**33**] [**40**] [**80**], G60 zinc coating; cleaned, pretreated, and primed with manufacturer's standard baked-on, rust-inhibitive primer.

    a. Color: [**Manufacturer's standard**] [**Gray**] [**White**] [**Gray top surface with white underside**].

4. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 33 minimum, AZ50 aluminum-zinc alloy coating.
5. Deck Profile: [**As indicated**] [**Type NR, narrow rib**] [**Type IR, intermediate rib**] [**Type WR, wide rib**] [**Type 3DR, deep rib**] [**Long span**].
6. Cellular Deck Profile: [**As indicated**] [**Type WR, wide rib**] [**Type 3DR, deep rib**] [**Long span**], with bottom plate.
7. Profile Depth: [**As indicated**] [**1-1/2 inches**] [**2 inches**] [**3 inches**] [**4-1/2 inches**] [**6 inches**] [**7-1/2 inches**].
8. Design Uncoated-Steel Thickness: [**As indicated**] [**0.0295 inch**] [**0.0358 inch**] [**0.0474 inch**] [**0.0598 inch**] [**0.0747 inch**].
9. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: [**As indicated**] [**0.0358/0.0358 inch**] [**0.0358/0.0474 inch**] [**0.0474/0.0474 inch**] [**0.0474/0.0598 inch**] [**0.0598/0.0474 inch**] [**0.0598/0.0598 inch**].
10. Span Condition: [**As indicated**] [**Simple span**] [**Double span**] [**Triple span or more**].
11. Side Laps: [**Overlapped**] [**Interlocking seam**] [**Overlapped or interlocking seam at Contractor's option**].

2.3 COMPOSITE FLOOR DECK

A. Composite Steel Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 30, with the minimum section properties indicated, and with the following:

1. Galvanized and Shop-Primed Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating; with unpainted top surface and cleaned and pretreated bottom surface primed with manufacturer's standard white baked-on, rust-inhibitive primer.
2. Profile Depth: 2 inches.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 30 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck, unless otherwise indicated.

H. Piercing Hanger Tabs: Piercing steel sheet hanger attachment devices for use with floor deck.

I. Weld Washers: Uncoated steel sheet, shaped to fit deck rib, 0.0747 inch thick, with factory-punched hole of 3/8-inch minimum diameter.

J. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

K. Flat Sump Plate: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

L. Galvanizing Repair Paint: ASTM A 780.

M. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels, if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
3. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 18 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels, unless otherwise indicated.

E. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FLOOR-DECK INSTALLATION

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.
4. Weld Washers: Install weld washers at each weld location.

B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of half of the span or 36 inches, and as follows:

1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
2. Mechanically clinch or button punch.
3. Fasten with a minimum of 1-1/2-inch- long welds.

C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped.

D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations, unless otherwise indicated.

E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

F. Install piercing hanger tabs at 14 inches apart in both directions, within 9 inches of walls at ends, and not more than 12 inches from walls at sides, unless otherwise indicated.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field welds will be subject to inspection.

C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.

D. Remove and replace work that does not comply with specified requirements.

E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.

1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Division 09.

C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Division 09.

D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

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. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.

B. Related Sections include the following:

1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.
2. Division 09 Section "Non-Structural Metal Framing" for interior non-load-bearing, metal-stud framing and ceiling-suspension assemblies.
3. Division 09 Section "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads: As indicated.

a. Dead Loads: See Design Drawings.
b. Live Loads: See Design Drawings.
c. Roof Loads: See Design Drawings.
d. Snow Loads: See Design Drawings.
e. Wind Loads: See Design Drawings.
f. Seismic Loads: See Design Drawings.

2. Deflection Limits: Design framing systems to withstand[**design loads**] without deflections greater than the following:

a. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.

3. Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:

    a. Upward and downward movement of 3/4 inch.

B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."

1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit MR 4.1: 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.

C. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Welding certificates.

E. Qualification Data: For professional engineer.

F. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.

5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

G. Research/Evaluation Reports: For cold-formed metal framing.

1.5 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.

B. 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.

D. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, ductility, and metallic-coating thickness.

E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."

F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."

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

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:

1. Allied Studco.
2. AllSteel Products, Inc.
3. California Expanded Metal Products Company.
4. Clark Steel Framing.
5. Consolidated Fabricators Corp.; Building Products Division.
6. Craco Metals Manufacturing, LLC.
7. Custom Stud, Inc.
8. Dale/Incor.
9. Design Shapes in Steel.
10. Dietrich Metal Framing; a Worthington Industries Company.
11. Formetal Co. Inc. (The).
12. Innovative Steel Systems.
13. MarinoWare; a division of Ware Industries.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. Steel Construction Systems.
18. Steeler, Inc.
19. Super Stud Building Products, Inc.
20. United Metal Products, Inc.

2.2 MATERIALS

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: As required by structural performance.
2. Coating: G60, A60, AZ50, or GF30.

C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: As required by structural performance.
2. Coating: G90.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: See Design Drawings.
2. Flange Width: See Design Drawings.
3. Section Properties: See Design Drawings.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: See Design Drawings.
2. Flange Width: See Design Drawings..

C. Vertical Deflection Clips: Manufacturer's standard bypass clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

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

a. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads and transfer them to the primary structure, and as follows:

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. Dietrich Metal Framing; a Worthington Industries Company.
b. MarinoWare, a division of Ware Industries.
c. SCAFCO Corporation
d. The Steel Network, Inc.

2.4 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.

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

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

2.5 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

B. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

C. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

D. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

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

E. Welding Electrodes: Comply with AWS standards.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.

D. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

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

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.

4. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

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

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or tracks to structural members indicated to receive sprayed fire-resistive materials.

B. After applying sprayed fire-resistive materials, remove only as much of these materials as needed to complete installation of cold-formed framing without reducing thickness of fire-resistive materials below that are required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

C. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

D. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

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

B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

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

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

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.

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

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

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

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

H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

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

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to[**top and**] bottom track, unless otherwise indicated. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single-leg deflection tracks and anchor to building structure.
2. Install double deep-leg deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to bypassing studs and anchor to building structure.
4. Connect drift clips to cold formed metal framing and anchor to building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

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

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

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal fabrications.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance:

1. Counter Tops and Vanities: Provide countertop and vanity framing capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections, or of exhibiting excessive deflections in any of the components making up the countertops and vanities:

   a. All deadloads.
   b. 500 pound live load placed on the countertop and vanity.
   c. Deflection at Midspan: L/500 times span or 1/8” whichever is less.

2. Tube Framing for Partial Height Walls: Provide tube framing for partial height walls capable of withstanding a deflection not to exceed 2L/1440 of the wall height when subjected to a positive and negative pressure of 5 psf.

B. Exterior Metal Fabrications: All exterior metal fabrications shall be fabricated and installed to prevent buckling, opening up of joints and overstressing of welds and fasteners under the following temperature conditions:

1. Base fabrication on a temperature of +70 degrees F. at time of installation with allowance made for an exposed metal surface temperature range of -5 degrees F. to +180 degrees F. Make all necessary adjustments and provisions for concealed expansion.

1.3 SUBMITTALS

A. Product Data: Submit product data for the following:

1. Paint products.
2. Grout.

B. Shop Drawings: Submit shop drawings detailing the fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1. For installed products indicated to comply with design loads, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

C. Submittals for LEED-NC:

1. Completed "LEED Criteria Worksheet," for each material of the product, assembly, or used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.

    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Maine and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal fabrications that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. AWS D1.3, "Structural Welding Code--Sheet Steel."
3. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 STORAGE, DELIVERY AND HANDLING

A. Store metal fabrications in a dry, well-ventilated, weathertight place. Deliver and handle so as to prevent any type of damage to the fabricated work.

1.6 PROJECT CONDITIONS

A. Field Measurements: Where metal fabrications are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

2.2 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.

C. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500, or hot formed steel tubing complying with ASTM A 501.

D. Steel Pipe: ASTM A 53, standard weight (Schedule 40) minimum, unless otherwise indicated or required to satisfy the performance requirements; finish as follows:

1. Black finish, unless otherwise indicated.
2. Galvanized finish for exterior installations and where indicated.

E. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance

to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 FASTENERS

A. General: Provide Type 304 or 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, where built into exterior walls. Select fasteners for type, grade, and class required.

B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

D. Machine Screws: ASME B18.6.3 (ASME B18.6.7M).

E. Lag Bolts: ASME B18.2.1 (ASME B18.2.3.8M).

F. Wood Screws: Flat head, carbon steel, ASME B18.6.1.

G. Plain Washers: Round, carbon steel, ASME B18.22.1 (ASME B18.22M).

H. Lock Washers: Helical, spring type, carbon steel, ASME B18.21.1 (ASME B18.21.2M).

I. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Indoor Expansion Anchor Material: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Exterior Expansion Anchor Material: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

J. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as needed.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.6 CONCRETE FILL

A. Concrete Materials and Properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8" with at least 95 % passing a 3/8" sieve and not more than 10% passing a No. 8 sieve. Fill shall be proportioned to provide a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

1. Welded connections may be used where bolted connections are shown.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Weld corners and seams continuously along entire line of contact to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

E. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices and fasteners to secure metal fabrications rigidly in place and to support indicated loads.

F. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

G. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

H. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.

I. Remove sharp or rough areas on exposed traffic surfaces.

J. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head

(countersunk) screws or bolts. Locate joints where least conspicuous. Make up threaded connections tight so that threads are entirely concealed.

K. Hot dip galvanize all exterior ferrous metal fabrications embedded in concrete. Hot dip galvanize all other items where specified or shown.

1. Exterior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are not controlled by the building heating and cooling systems.
2. Interior ferrous metal fabrications are defined as those items which are indicated to be installed in areas exposed to conditions which are controlled by the building heating and cooling systems.

2.8 STEEL LADDERS

A. General: Fabricate ladders for locations shown, with dimensions, spacings, details, and anchorages as indicated.

1. Comply with ANSI A14.3, unless otherwise indicated.
2. For elevator pit ladders, comply with ASME A17.1.

B. Siderails: Continuous, 3/8-by-2-1/2-inch (10-by-64-mm) steel flat bars, with eased edges, spaced 16 inches (406 mm) apart.

C. Bar Rungs: 3/4-inch- (19-mm-) diameter steel bars, spaced 12 inches (300 mm) o.c.

D. Fit rungs in centerline of side rails; plug-weld and grind smooth on outer rail faces.

E. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets. Size brackets to support design loads specified in ANSI A14.3.

F. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.

G. Galvanize exterior ladders; prime paint interior ladders.

2.9 LADDER SAFETY CAGES

A. General: Fabricate ladder safety cages to comply with ANSI A14.3. Assemble by welding or riveting.

B. Primary Hoops: 5/16-by-4-inch (8-by-100-mm) steel flat bar hoops. Provide at tops and bottoms of cages and spaced not more than 20 feet (6 m) o.c.

C. Secondary Intermediate Hoops: 5/16-by-2-inch (8-by-50-mm) steel flat bar hoops, spaced not more than 48 inches (1200 mm) o.c. between primary hoops.

D. Vertical Bars: 5/16-by-2-inch (8-by-50-mm) steel flat bars secured to each hoop, spaced approximately 9 inches (230 mm) o.c.

E. Fasten assembled safety cage to ladder rails and adjacent construction by welding or riveting, unless otherwise indicated.

F. Galvanize exterior ladder safety cages; prime paint interior ladder safety cages.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize exterior plates after fabrication; prime paint interior plates after fabrication.

2.11 LOOSE STEEL LINTELS

A. Fabricate loose structural-steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated.

B. Weld adjoining members together to form a single unit where indicated.

C. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches (200 mm), unless otherwise indicated.

D. Galvanize loose steel lintels located in exterior walls. Prime paint loose steel lintels located in interior walls.

2.12 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports indicated and as necessary to complete the Work and which are not a part of the structural framework, including but not limited to framing and supports for elevator hoistway beams, elevator sills, concealed steel all-glass entrance framing, overhead lobby door frames, overhead rolling doors and grilles, smoke draft curtains, countertop and vanities, ceiling hung toilet compartments, projection screens, ceiling hung televisions and cameras, and tube framing for partial height walls, CMU partition head supports, revolving and swing door entrance canopy tube steel framing, interior sliding automatic entrance doors, mechanical and electrical equipment.

B. Fabricate units from structural-steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Framing for Ceiling Hung Toilet Compartments: Provide framing for ceiling hung toilet compartments, coordinated with the partitions and including provisions for partition anchorage as required to sustain imposed loads and to limit deflections to L/360 between hangers, fabricated from the following.

1. Structural Steel Shapes, Plates and Bars: ASTM A36/A36M.
2. Modular Structural Framing System: ASTM A569; modular, structural quality steel pre-formed "U" channel framing system with continuous open slot prepared to receive attachment nuts, bolts, straps, threaded rods, beam clamps, hanger rods support brackets and other accessories. Provide manufacturers standard corrosion resistant finish.
3. Provide steel rods, ½" diameter, spaced not more than 36" o.c. Thread rods to receive anchor and stop nuts. Fit hangers with wedge shape washers for full bearing on sloping flanges of support beam.
4. Coordinate installation with toilet compartment manufacturer's written instructions and recommendations.

D. Countertop and Vanity Framing: Custom fabricate countertop and vanity framing, using steel shapes and plates, and cold finished mild steel bars at exposed conditions, for support framing and plywood, to the thicknesses, sizes and shapes shown, and as required to produce work of adequate strength and durability, without objectionable deflections. Use proven details of fabrication, as required, to achieve proper assembly and alignment of the various components of the work.

E. CMU Partition Head Supports: Fabricate supports from 4" x 4" x 1/4" x 36" long structural steel angles. Drill supports a maximum of 12" o.c. to receive expansion bolts.

F. Galvanize miscellaneous framing and supports at exterior locations; prime paint miscellaneous framing and supports at interior locations.

2.13 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from structural-steel shapes, plates, and bars of profiles shown with continuously welded joints, and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work. Provide anchors, welded to trim, for embedding in concrete or masonry construction, spaced not more than 6 inches (150 mm) from each end, 6 inches (150 mm) from corners, and 24 inches (600 mm) o.c., unless otherwise indicated.

C. Surface Applied Corner Guards: Provide corner guards fabricated from angles of sizes shown, or if not shown, of minimum 4-1/2" x 4-1/2" x ¼" thick equal leg angles. Drill and countersink legs of angles, for fastening to substrates indicated, with holes spaced 24" on center. Provide corner guard lengths of 42" if not otherwise indicated.

D. Cast-In Pit Angles and Edge Angles: Provide edge angles, and pit angles, fabricated from angles of size as shown, or required, with welded-on stud anchors spaced 24" on center. Provide pit and edge angles in as long lengths as possible. Miter and weld corners and provide splice plates for alignment between sections.

E. Galvanize exterior miscellaneous steel trim; prime paint interior miscellaneous steel trim.

2.14 STRUCTURAL-STEEL DOOR FRAMES FOR EXTERIOR WALL OVERHEAD DOOR OPENINGS

A. Fabricate steel door frames from continuous lengths of structural shapes and plates of size and to dimensions indicated. Weld together shapes and plates unless otherwise indicated. Drill and tap frames as necessary to accept vertical lifting fabric door guide rail hardware.

B. Exterior Wall Overhead Door Openings: Provide adjustable corrugated steel strap anchors consisting of spot welded straps and adjustable anchors; with adjustable anchor leg not less than 2 inches (50 mm) wide by 6 inches (150 mm) long x 1/8" thick with a minimum 2-inch (50-mm) hook, unless otherwise indicated, for securing door frames into adjoining masonry. Weld anchor straps to frame jambs spaced no more than 12 inches (300 mm) from both bottom and head of frame, and equally spaced not more than 30 inches (750 mm) apart.

C. Extend bottom of frames to floor elevation indicated with steel angle clips welded to frames for anchoring frame to floor with expansion shields and bolts.

D. Galvanize frames.

2.15 PIPE GUARDS

A. Provide pipe guards of 3-by-3-by-5/16-inch (76-by-76-by-8-mm) steel angles, extending from floor to 42 inches (1100 mm) above floor, with 3/8-inch (10-mm) steel baseplates for bolting to floor. Provide at least two vertical angles at each location, except at internal corners where one may be used. Connect tops of angles and anchor to wall or column with 1/4-by-2-inch (6-by-50-mm) steel strap braces welded to angles and bolted to wall.

B. Provide pipe guards fabricated from ¼" thick, 12" high, radiused steel plate, for bolting to columns where indicated.

C. Galvanize pipe guards after fabrication.

2.16 PIPE BOLLARDS

A. Fabricate pipe bollards from Schedule 40 steel pipe at non-vehicular locations and from Schedule 80 steel pipe at vehicular locations, unless otherwise indicated.

1. Cap bollards with 1/4-inch- (6-mm-) minimum steel plate, unless otherwise indicated.

B. Fabricate bollards with 3/8-inch- (10-mm-) thick steel baseplates for bolting to concrete slab where indicated. Drill baseplates at all four corners for 3/4-inch (19-mm) anchor bolts.

C. Fabricate sleeves for bollard anchorage from Schedule 40 steel pipe with 1/4-inch (6-mm) thick steel plate welded to bottom of sleeve unless otherwise shown.

D. Galvanize bollards after fabrication.

2.17 TRENCH DRAIN GRATING ASSEMBLIES

A. General: Frost proof, salt proof and acid resistant, heavy duty roadway trench drain grating assemblies shall be provided that are specifically engineered and fabricated for vehicular loads

and which provide for the integration of the drainage and waterproofing systems indicated; components as follows:

1. Grating: Fabricated from heavy duty ductile iron complying with ASTM A536 grade 65-45-12 and with DIN 19580 Class E (135,000 lbs – 2,788 psi medium industrial classification). Each grating shall be secured to the channel body using bolt free locking system. The grating shall have a slot size that makes it ADA compliant (Product Reference: Aco Polymer Products, Inc. Chardon, OH; ADA Iron Pattern Type 478Q).

2. Drain Top: Furnish each drain channel body with a galvanized steel edge rail that will act as a termination bar for the waterproofing. (Product Reference: Aco Polymer Products, Inc. Chardon, OH; Membrane Drain).

3. Drain Channel Bodies: Drain bodies shall be fabricated from polyester resin binder reinforced by mineral aggregates and fillers which, when combined, will produce a compressive strength of 14,000 psi, bear a flexural strength of 4,000 psi, have a water absorption of 0.07%. Shape all drain channel bodies to the profiles indicated. Coordinate punch out locations and rain leaders in channel bodies. Each channel shall be cast with a sealant groove in the female end to allow for the field placement of a compatible, and adherent, sealant bead to be placed in the joint. The drain channel bodies shall be comprised of 2 products as follows:

   a. For Shallow Areas over the Cap Beams: (Product Reference: Aco Polymer Products, Inc. Chardon, OH, SlabDrain H80).

   b. Sloping Drain Body: Custom fabricate sloping drain bodies to suit the depths indicated on the drawings similar in design to the Aco Polymer Products, Inc., Chardon, OH, Klassik Drain K100S drain body system.

B. Provide each assembly with polymer concrete closing end caps, membrane drain integral anchors, and accurately formed joints.

C. Set all drain body channels in polymer modified concrete materials of a type and manufacture as recommended by the trench drain manufacturer for the application indicated.

D. Field miter drain channel bodies, drain top s and gratings to segmented profiles indicated.

2.18 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.19 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 “Solvent Cleaning,” followed with the SSPC surface-preparation specifications listed below and environmental exposure conditions of installed metal fabrications. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.

1. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Apply a minimum of one coat of shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be field welded, and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Dry Film Thickness of Primer: 2.5 to 3.0 mils, dry film thickness. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturers directions.

2.20 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Basis of Design Product: Stair nosings shall be type No.8301 as manufactured by American Safety Tread Company, Helena, Alabama 35080.Telephone 1-800-245-4881. The base shall consist of heat treated extruded aluminum alloy 6063-T6. The abrasive filler shall consist of a mixture of aluminum oxide and silicon carbide granules in an epoxy matrix locked into the extruded channels of the base. The abrasive ribs shall project a minimum of 1/16 inch above the extruded channels. Nosings shall terminate not more than 3" from ends of steps for poured concrete stairs;for concrete filled steel pan stairs, nosings shall be full length of steps less 1/8" clearance. Color shall be as selected by the architect.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches (125 mm) wide, with two holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

3.2 SETTING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.
2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

C. Ceiling Hung Toilet Partitions: Anchor supports securely to, and rigidly brace from, overhead building structure.

D. CMU Partition Head Supports: Unless otherwise indicated place partition head supports on alternate faces of CMU partitions every 6'-0" o.c. and expansion bolt to underside of structure. Do not bolt to CMU partitions.

3.4 INSTALLING PIPE GUARDS

A. Install pipe guards at exposed vertical pipes in Bag Make-Up Areas and at exposed vertical pipes in other areas where they are not protected by curbs or other barriers yet are exposed to tug traffic. Install by bolting to floor and wall or column with drilled-in expansion anchors.

3.5 INSTALLING PIPE BOLLARDS

A. Anchor bollards in concrete with pipe sleeves preset and anchored into concrete. After bollards have been inserted into sleeves, fill annular space between bollard and sleeve solidly with sand.

B. Anchor bollards to existing construction with postinstalled anchors and bolts to the extent indicated. Provide four 3/4-inch (19-mm) anchors at each bollard, unless otherwise indicated. Embed anchors at least 4 inches (100 mm) in existing concrete.

C. Fill bollards solidly with concrete, mounding top surface.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 50 00

SECTION 05 51 00 - METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior and exterior metal stairs.

1.2 PERFORMANCE REQUIREMENTS

A. General: In engineering metal stairs to withstand structural loads indicated, determine allowable design working stresses of component materials based on the following:

1. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."
2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance: Provide metal stairs capable of withstanding the following structural loads without exceeding the allowable design working stress of the materials involved, including anchors and connections. Apply each load to produce the maximum stress in each component of metal stairs.

1. Treads and Platforms of Metal Stairs: Capable of withstanding a uniform load of 100 lbf/sq. ft. (4.79 kN/sq. m) or a concentrated load of 300 lbf (1.33 kN) on an area of 12” wide by depth of tread and spaced 36” center to center, whichever produces the greater stress as required by the International Building Code, 2003,ed.
2. Stair Framing: Capable of withstanding stresses resulting from loads specified above in addition to stresses resulting from railing system loads.
3. Limit deflection of treads, platforms, and framing members to L/360 or 1/4 inch (6.4 mm), whichever is less.

C. Exterior Metal Fabrications: All exterior metal stairs shall be fabricated and installed to prevent buckling, opening up of joints and overstressing of welds and fasteners under the following temperature conditions:

1. Base fabrication on a temperature of +70 degrees F. at time of installation with allowance made for an exposed metal surface temperature range of -5 degrees F. to +180 degrees F. Make all necessary adjustments and provisions for concealed expansion.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

E. Regulatory Requirements: Comply with the requirements of Part 1910 of the Occupational Safety and Health Standards (OSHA), the American Disabilities Act (ADA), and local regulatory requirements as applicable to stairs, handrails and the protection of openings; where regulatory requirements conflict the more stringent shall apply.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings showing fabrication and installation details for metal stairs. Include plans, elevations, sections, showing working points and column centerline locations in plan and in section. Include details of metal stairs and their connections including stringers, treads, risers, headers, platforms, struts, hangers, supplemental steel framing for connection and alignment of threaded rod hangers to structural steel building framing, railings, handrails, guardrails, brackets, reinforcements, anchors, welded and bolted field and shop connections (size and location), and any other supplemental information.

1. For installed products indicated to comply with performance requirements, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

2. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale.

B. Samples: Submit samples for the following products. Prepare Samples from the same material to be used for the Work, and finished as specified.

C. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."

2. Product Certificates for Credit MR 4.: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing metal stairs similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

1. Employ only experienced tradesmen for both fabrication and installation, who are capable of producing work of the highest standards of quality in the industry.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Maine and who is experienced in providing engineering services of the

kind indicated. Engineering services are defined as those performed for installations of metal stairs (including handrails and railing systems) that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel," AWS D1.2 “Structural Welding Code – Aluminum,” and AWS D1.3, "Structural Welding Code--Sheet Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Where metal stairs are indicated to fit walls and other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal stairs without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide metal free from pitting, seam marks, roller marks, and other imperfections where exposed to view on finished units. Do not use steel sheet with variations in flatness exceeding those permitted by referenced standards for stretcher-leveled sheet.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.

D. Steel Tubing: Cold-formed steel tubing complying with ASTM A 500.

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Uncoated, Cold-Rolled Steel Sheet: Commercial quality, complying with ASTM A 366/A 366M; or structural quality, complying with ASTM A 611, Grade A, unless another grade is required by performance requirements.

G. Uncoated, Hot-Rolled Steel Sheet: Commercial quality, complying with ASTM A 569/A 569M; or structural quality, complying with ASTM A 570/A 570M, Grade 30, unless another grade is required by performance requirements.

H. Galvanized Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating, either commercial quality or structural quality, Grade 33 (Grade 230), unless another grade is required for performance requirements.

1. Perforated Steel Sheet Infill: Either commercial quality or structural quality carbon steel. Perforations shall be sized and spaced to match Architect's selected sample of perforated steel sheet.

I. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloys welded.

2.2 FASTENERS

A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 25 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.

1. For aluminum stairs, use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Interior Metal Stairs: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.

2. Material for Exterior Metal Stairs: Alloy Group 1 or 2 stainless-steel bolts complying with ASTM F 593 (ASTM F 738M) and nuts complying with ASTM F 594 (ASTM F 836M).

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 CONCRETE FILL AND REINFORCING MATERIALS

A. Concrete Materials and Properties: Composed of ASTM C150 Type I Portland cement, ASTM C33 sand and coarse aggregates and potable water to produce a low slump mix suitable for placement. Grade coarse aggregate from 1/8" with at least 95 % passing a 3/8" sieve and not more than 10% passing a No. 8 sieve. Fill shall be proportioned to provide a minimum 28-day compressive strength of 3000 psi (20 MPa).

B. Nonslip-Aggregate Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.

C. Welded Wire Fabric: ASTM A 185, 4 by 4 inches (100 by 100 mm)--W1.4 by W1.4.

2.5 FABRICATION, GENERAL

A. Provide complete stair assemblies, including metal framing, hangers, struts, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.

1. Join components by welding, unless otherwise indicated.
2. Use connections that maintain structural value of joined pieces.
3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.

B. NAAMM Stair Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Stairs" in NAAMM AMP 510, "Metal Stairs Manual," for class of stair designated, unless more stringent requirements are indicated.

1. Architectural class.

C. Shop Assembly: Preassemble stairs in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

D. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Shear and punch metals cleanly and accurately. Remove sharp or rough areas on exposed surfaces.

E. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

F. Weld connections to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Weld exposed corners and seams continuously, unless otherwise indicated.
5. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 STEEL-FRAMED STAIRS

A. Stair Framing: Fabricate stringers of structural-steel channels, plates, or a combination of both, as indicated. Provide closures for exposed ends of stringers. Construct platforms of structural-steel channel headers and miscellaneous framing members as indicated. Bolt or weld headers to stringers; bolt or weld framing members to stringers and headers. If using bolts, fabricate and join so bolts are not exposed on finished surfaces.

1. Where stairs are enclosed by gypsum board shaft-wall assemblies, provide hanger rods to support landings from floor construction above. Locate hanger rods within stud space of shaft-wall construction.
2. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.

B. Metal Risers, Subtread Pans, and Subplatforms: Form to configurations shown from steel sheet of thickness necessary to support indicated loads, but not less than 0.0677 inch (1.7 mm).

1. Steel Sheet:

   a. Interior Stairs: Uncoated cold-rolled steel sheet.
   b. Exterior Stairs: Galvanized steel sheet.

2. Directly weld metal pans to stringers; locate welds on side of subtreads to be concealed by concrete fill. Do not weld risers to stringers.
3. Shape metal pans to include nosing integral with riser.
4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads. Weld subplatforms to platform framing.

   a. Smooth Soffit Construction: Construct subplatforms with smooth soffits.

C. Steel Floor Plate Treads, Risers, and Platforms: Form to configurations shown from raised-pattern steel floor plate of thickness necessary to support indicated loads, but not less than 1/4 inch (6.4 mm).

1. Form treads with integral nosing and back edge stiffener. Weld steel supporting brackets to stringers and weld treads to brackets.
2. Fabricate platforms with integral nosings matching treads and weld to platform framing.

2.7 STAIR HANDRAILS AND RAILINGS

A. General:

1. Non-Public (Back of House) and Airside Gate Stair Handrails and Railings: Comply with applicable requirements in Division 5 Section "Pipe and Tube Railings":

2. Public Stair Handrails and Railings: Comply with applicable requirements in Division 5 Section "Ornamental Handrails and Railings."

2.8 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal stairs after assembly.

1. Prime paint interior stairs and components.

2. Fabricate all exterior stairs and components from hot dipped galvanized materials.

3. Fabricate all removable stairs from mill finished aluminum.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123, for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strips 0.0299 inch (0.76 mm) thick and heavier.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.
3. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 “Solvent Cleaning,” followed with the SSPC surface-preparation specifications listed below and environmental exposure conditions of installed metal fabrications. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.

1. Interiors (SSPC Zone 1A): SSPC SP 3, "Power Tool Cleaning."

E. Apply a minimum of one coat of shop primer to uncoated surfaces of metal stair fabrications, except those with galvanized finishes and those to be field welded, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Dry Film Thickness of Primer: 2.5 to 3.0 mils, dry film thickness. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturers directions.

F. Do not deliver primed metal stair work until primer has dried.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Metal Stair Installation, General: Erect stairs, railings and handrails, and infill panels square, plumb, straight and true to line and level, in the correct locations and in proper relation to adjoining work with neatly fitted joints and intersections. Installation shall be secure and rigid.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors. Drill holes for bolts to the exact diameter of the bolt. Provide screws threaded full length to the screw head.

C. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs.

D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

E. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Leave work exposed to view, including stair soffits, clean, smooth and neatly finished.

G. Include supplementary parts necessary to complete each item, though such work is not definitely shown or specified.

3.2 INSTALLING TUBE RAILINGS AND HANDRAILS

A. Adjust handrails and railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by performance requirements. Plumb posts in each direction.

1. Anchor steel posts by welding directly to steel supporting members.
2. Anchor aluminum posts by bolting directly to aluminum supporting members.
3. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

B. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to satisfy the performance requirements. Secure wall brackets to building construction as follows:

1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
2. Use type of bracket with predrilled hole for exposed bolt anchorage.
3. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
4. For hollow masonry anchorage, use toggle bolts.

5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to satisfy the performance requirements.

3.3 CONCRETE FILL INSTALLATION

A. Place concrete fill into steel pan platforms and treads. Screed concrete fill level and finish with wood float. After screeding, permit concrete fill to cure until it can support the weight of workmen standing on boards.

1. Refer to Division 9 Sections for finish flooring installation.

3.4 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 51 00

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pipe and tube handrails and railings.

1.2 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of handrail and railing materials based on the following:

1. Structural Steel: AISC S335, "Specification for Structural Steel Buildings Allowable Stress Design and Plastic Design with Commentary."
2. Cold-Formed Structural Steel: AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

B. Structural Performance of Handrails and Railings: As required by the International Building Code, 2003 ed.

1. Top Rails: The simultaneous application of a lateral force of 40 plf and a vertical load 50 plf, both applied to the top of the railing. The total lateral force and total vertical load shall be at least 200 pounds each.

2. Intermediate and Bottom Rails: The simultaneous application of 40 plf applied horizontally and 50 plf applied vertically; however, lateral and vertical design loads on intermediate and bottom rails need not be considered in the design of posts and anchorages. For railings having infill panels, the panels shall be designed for a uniform lateral load of 20 psf.

C. Exterior Metal Fabrications: All exterior pipe and tube railings shall be fabricated and installed to prevent buckling, opening up of joints and overstressing of welds and fasteners under the following temperature conditions:

1. Base fabrication on a temperature of +70 degrees F. at time of installation with allowance made for an exposed metal surface temperature range of -5 degrees F. to +180 degrees F. Make all necessary adjustments and provisions for concealed expansion.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

E. Regulatory Requirements: Comply with the requirements of Part 1910 of the Occupational Safety and Health Standards (OSHA), the American Disabilities Act (ADA), and local regulatory requirements as applicable to stairs, handrails and the protection of openings; where regulatory requirements conflict the more stringent shall apply.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings indicating fabrication and installation of pipe and tube railings. Include plans, elevations, sections, component details, and attachments to other Work.

1. For installed pipe and tube railings indicated to comply with performance requirements, include structural analysis data, for information only, signed and sealed by the qualified professional engineer responsible for their preparation.

2. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale.

B. Samples: Submit samples for each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. 6-inch- (150-mm-) long sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters.
2. Fittings and brackets.
3. Guardrail infill.

C. Submittals for LEED-NC:
1. Completed "LEED Criteria Worksheet," for each material of the product, assembly, or used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.
    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing handrails and railings similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

1. Employ only experienced tradesmen for both fabrication and installation, who are capable of producing work of the highest standards of quality in the industry.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Maine and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of

handrails and railings that are similar to those indicated for this Project in material, design, and extent.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, "Structural Welding Code--Steel."
2. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.5 STORAGE, DELIVERY AND HANDLING

A. Store handrails and railings in a dry, well-ventilated, weathertight place. Deliver and handle so as to prevent any type of damage to the fabricated work.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy the performance requirements.

PART 2 - PRODUCTS

2.1 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:

1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

    a. Black finish, unless otherwise indicated.
    b. Galvanized finish for exterior installations and where indicated.

2. Type S – Seamless, Grade A suitable for close coiling or cold bending, standard weight (Schedule 40) minimum, unless otherwise indicated or required to satisfy performance requirements.
3. Steel Tubing: Cold-formed steel tubing, ASTM A 500, Grade A, unless otherwise indicated or required to satisfy the performance requirements.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
5. Cold Finished Steel Bars: ASTM A108, grade as selected by fabricator.

C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding performance requirements.

1. For steel handrails, railings, and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Fasteners for Interconnecting Handrail and Railing Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

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

D. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place anchors.
2. Chemical anchors.
3. Expansion anchors.

2.3 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

B. Shop Primer for Galvanized Steel: Zinc-dust, zinc-oxide primer formulated for priming zinc-coated steel and for compatibility with finish paint systems indicated, and complying with SSPC-Paint 5.

C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12, except containing no asbestos fibers, or cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to satisfy the performance requirements.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as detailed.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

G. Provide inserts and other anchorage devices for connecting handrails and railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

H. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) greater than outside dimensions of post, and steel plate forming bottom closure.

I. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

J. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

K. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

L. Provide weep holes or another means to drain entrapped water in hollow sections of handrail and railing members that are exposed to exterior or to moisture from condensation or other sources.

M. Fabricate joints that will be exposed to weather in a watertight manner.

N. Close exposed ends of handrail and railing members with prefabricated end fittings.

O. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

P. Toe Boards: Where indicated, provide toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

Q. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.6 FINISHES

A. Comply with NAAMM'S "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal railings after assembly.

1. Prime paint interior stair railings and components.

2. Fabricate all exterior stair railings and components from hot dipped galvanized materials.

C. Galvanized Handrails and Railings: Hot-dip galvanize exterior steel and iron handrails and railings to comply with ASTM A 123. Hot-dip galvanize hardware for exterior steel and iron handrails and railings to comply with ASTM A 153/A 153M.

D. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

E. For galvanized handrails and railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

F. For nongalvanized steel handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

G. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces by removing oil, grease, and similar contaminants in accordance with SSPC -SP 1 “Solvent Cleaning,” followed with the SSPC surface-preparation specifications listed below and environmental exposure conditions of installed metal fabrications. Surface preparation shall be done after fabrication and immediately prior to shop painting. Apply shop coat of paint within 4 hours after cleaning and before rust bloom occurs.

H. Apply a minimum of one coat of shop primer to uncoated surfaces of metal railing fabrications, except those with galvanized finishes and those to be field welded, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

1. Stripe paint edges, corners, crevices, bolts, and welds.
2. Dry Film Thickness of Primer: 2.5 to 3.0 mils, dry film thickness. Apply paint thoroughly and evenly to dry surfaces, free from holidays and pinholes, in accordance with manufacturers directions.

I. Do not deliver primed pipe and tube railing work until primer has dried.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrail and railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required to satisfy the performance requirements. Plumb posts in each direction.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

A. Form or core-drill holes not less than 5 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

1. Nonshrink, nonmetallic grout.

B. Leave anchorage joint exposed; wipe off surplus anchoring material; and leave 1/8-inch (3-mm) build-up, sloped away from post.

C. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe posts, weld flanges to post and bolt to supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor railing ends into concrete and masonry with round flanges connected to railing ends and anchored into wall construction with postinstalled anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces.

1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to satisfy the performance requirements.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to satisfy the performance requirements.

3.7 CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.8 PROTECTION

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

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

SECTION 05 72 00 - ORNAMENTAL HANDRAILS AND RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes ornamental handrails and railings.

1.2 PERFORMANCE REQUIREMENTS

A. General: In engineering handrails and railings to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:

1. Stainless Steel: ASCE 8, "Specification for the Design of Cold-Formed Stainless Steel Structural Members."
2. For fully tempered glass in glass-supported handrails and railings, use a safety factor of 4 applied to the applicable modulus of rupture listed in "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

B. Structural Performance of Handrails and Railings: As required by the International Building Code, 2003 ed., railings shall be designed to resist the following loads:

1. Top Rails: The simultaneous application of a lateral force of 50 plf and a vertical load 100 plf, both applied to the top of the railing. The total lateral force and total vertical load shall be at least 200 pounds each.

2. Intermediate and Bottom Rails: The simultaneous application of 40 plf applied horizontally and 50 plf applied vertically; however, lateral and vertical design loads on intermediate and bottom rails need not be considered in the design of posts and anchorages. For railings having infill panels, the panels shall be designed for a uniform lateral load of 20 psf.

3. Glass-Supported Handrails and Railings: Provide glass-supported handrails and railings capable of withstanding loads indicated. Support each section of top rail by a minimum of three glass panels or by other means so top rail will remain in place if any one panel fails.

C. Regulatory Requirements: Comply with the requirements of Part 1910 of the Occupational Safety and Health Standards (OSHA), the American Disabilities Act (ADA), and local regulatory requirements as applicable to stairs, handrails and the protection of openings; where regulatory requirements conflict the more stringent shall apply.

1.3 SUBMITTALS

A. Shop Drawings: Submit shop drawings including plans, elevations, sections, details, and attachments to other work.

1. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

2. Include plans and elevations at not less than 1" to 1'-0" scale, and include details of sections and connections at not less than 3" to 1'-0" scale.

B. Samples: Submit samples for each type of exposed finish required.

1. Sections of each distinctly different linear railing and baggage cart guard member, including handrails, top rails, posts, and balusters.
2. Each type of glass required.
3. Fittings and brackets.
4. Welded connections.
5. Assembled Samples of railing systems, made from full-size components, including top rail, post, handrail, and infill. Show method of finishing members at intersections. Samples need not be full height.

C. Mill and Glass Treatment Certificates: Submit mill and glass treatment certificates signed by manufacturers of stainless-steel and heat soaked glass products certifying that products furnished comply with requirements.

D. Submittals for LEED-NC:
1. Completed "LEED Criteria Worksheet," for each material of the product, assembly, or used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.
    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.4 QUALITY ASSURANCE

A. Fabricator/Installer Qualifications: A firm experienced in producing handrails and railings similar to those indicated for this Project for a minimum of 5 years, with a record of successful in-service performance, with sufficient production capacity to produce required units without causing delay in the work.

1. Employ only experienced tradesmen for both fabrication and installation, who are capable of producing work of the highest standards of quality in the industry.

B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Maine and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of

handrails and railings that are similar to those indicated for this Project in material, design, and extent.

C. Source Limitations: Obtain each type of railing and baggage cart guard through one source from a single manufacturer.

D. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.6, "Structural Welding Code--Stainless Steel."

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for each form and finish of railing consisting of two posts, top rail, infill area, and anchorage system components that are full height and are not less than 24 inches (600 mm) in length.

1.5 STORAGE

A. Store handrails and railings and baggage cart guards in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating handrails and railings without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.7 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish Setting Drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.8 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Stainless Steel: Grade or type designated below for each form required.

1. Tubing: ASTM A 554, Grade MT 304.
2. Pipe: ASTM A 312/A 312M, Grade TP 304.
3. Castings: ASTM A 743/A 743M, Grade CF 8 or CF 20.
4. Plate: ASTM A 666, Type 304.

C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated. Provide brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

1. Basis of Design for Wall Brackets: #223 Stainless Steel Wall Bracket; Julius Blum & Co., Inc.

2. Basis of Design for Post Flanges: #221 Stainless Steel Cover Flange; Julius Blum & Co., Inc.

2.2 GLASS AND GLAZING MATERIALS

A. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated), Type 1 (transparent flat glass), Quality-Q3. Provide products that have been tested for surface and edge compression according to ASTM C 1048 and for impact strength according to 16 CFR 1201 for Category II materials. After tempering, heat soak 100% of all fabricated glass units to European Union heat soaking standards, to eliminate inclusion related glass breakage. Statistical heat soaking shall not be permitted.

1. Clear Glass: Class 1 (clear).
2. Thickness for Structural Glass Balusters: 19.0 mm.
3. Thickness for Glass Infill Panels: As required by structural loads, but not less than 19.0 mm.
4. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.

B. Glazing Cement and Accessories for Structural Glazing: Provide glazing cement, setting blocks, shims, and related accessories as recommended or supplied by railing manufacturer for installing structural glazing in metal subrails.

1. Glazing Cement: Provide nonshrinking organic cement designed for curing by passing an electric current through metal subrail holding glass panel, as standard with manufacturer.

C. Glazing Gaskets for Glass Infill Panels: Provide glazing gaskets and related accessories recommended or supplied by railing manufacturer for installing glass infill panels in post-supported railings.

2.3 MISCELLANEOUS MATERIALS

A. Filler Metal and Electrodes: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, and strength.

2.4 FASTENERS

A. Fasteners for Anchoring Handrails and Railings and baggage cart guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring handrails and railings and baggage cart guards to other types of construction indicated and capable of withstanding design loads.

1. For stainless-steel handrails and railings and baggage cart guards, use fasteners fabricated from Type 304 or Type 316 stainless steel.

B. Fasteners for Interconnecting Handrail and Railings and baggage cart guards Components: Use fasteners fabricated from same basic metal as fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.

1. Provide concealed fasteners for interconnecting railing components and for attaching them to other Work, unless otherwise indicated.
2. Provide tamper-resistant flat-head machine screws for exposed fasteners, unless otherwise indicated

C. Cast-in-Place and Postinstalled Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Cast-in-place anchors.
2. Chemical anchors.
3. Expansion anchors.

2.5 GROUT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior applications.

2.6 FABRICATION

A. General: Fabricate railing and baggage cart guards to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Assemble handrails and railings and baggage cart guards in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and

handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as detailed.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain profile of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings and baggage cart guards for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Mechanical Connections: Fabricate handrails and railings and baggage cart guards by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

1. Fabricate splice joints for field connection using epoxy structural adhesive where this is manufacturer's standard splicing method.

G. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

H. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

I. For railing posts set in concrete, provide preset sleeves of steel not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (12 mm) larger than outside dimensions of post, and steel plate forming bottom closure.

J. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

K. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

L. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

M. Close exposed ends of railings and baggage cart guard members with prefabricated end fittings.

N. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

O. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.7 GLAZING PANEL FABRICATION

A. General: Fabricate to sizes and shapes required; provide for proper edge clearance and bite on glazing panels.

B. Structural Glass Balusters: Factory-bond glass to aluminum base and top-rail channels in railing manufacturer's plant using glazing cement to comply with manufacturer's written specifications, unless field glazing is standard with manufacturer.

C. Structural Balusters: Provide tempered glass panels.

D. Infill Panels: Provide tempered glass panels.

2.8 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

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

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 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.

2.9 STAINLESS-STEEL FINISHES

A. Remove or blend tool and die marks and stretch lines into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Bright, Directional Polish: No. 4 finish.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

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

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railings. Set handrails and railings and baggage cart guards accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust handrails and railings and baggage cart guards before anchoring to ensure alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and baggage cart guards and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws using plastic cement filler colored to match finish of handrails and railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in shop or in field.

3.4 ANCHORING POSTS

A. Use steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with the following

anchoring material, mixed and placed to comply with anchoring material manufacturer's written instructions:

1. Nonshrink, nonmetallic grout.

B. Cover anchorage joint with a flange of same metal as post, attached to post as follows:

1. By set screws.

C. Anchor posts to metal surfaces with flanges, angle or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For stainless-steel railings, weld flanges to post and bolt to metal supporting members.

3.5 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For steel-framed gypsum board assemblies, use hanger or lag bolts set into wood backing between studs. Coordinate with stud installation to locate backing members.
4. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed reinforcements using self-tapping screws of size and type required to support structural loads.

3.6 INSTALLING GLASS PANELS

A. Glass-Supported Railings: Install assembly to comply with railing manufacturer's written instructions.

1. Attach base channel to building structure, then insert and connect factory-fabricated and -assembled glass panels if glass was bonded to base and top rail channels in factory.

2. Attach base channel to building structure, then insert glass into base channel and bond with glazing cement unless glass was bonded to base and top rail channels in factory.

a. Support glass panels in base channel at quarter points with channel-shaped setting blocks that also act as shims to maintain uniform space for glazing cement. Fill remaining space in base channel with glazing cement for uniform support of glass.

3. Adjust spacing of glass panels so gaps between panels are equal before securing in position.

B. Post-Supported Glass Handrails and Railings: Install assembly to comply with railing manufacturer's written instructions. Erect posts and other metal railing components, then set factory-cut glass panels. Do not cut, drill, or alter glass panels in field. Protect edges from damage.

3.7 CLEANING

A. Clean stainless steel by washing thoroughly with clean water and soap and rinsing with clean water.

B. Clean and polish glass.

3.8 PROTECTION

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

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05720

SECTION 05 75 00 - DECORATIVE FORMED METAL

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. Closures and trim.
2. Interior wall panels.
3. Escalator enclosures.
4. Filler panels between dissimilar construction.
5. Heating-cooling unit enclosures.
6. Metal base.
7. Window stools.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for non-decorative metal fabrications.
2. Division 05 Section "Decorative Metal Railings."
3. Division 07 Section "Sheet Metal Roofing" for items made of formed metal for roofing.
4. Division 07 Section "Sheet Metal Flashing and Trim" for items made of formed metal for flashings and trim.
5. Division 07 Section "Roof Specialties" for items made of formed metal for parapets and copings.
6. Division 08 Section "Hollow Metal Doors and Frames" for flush hollow-metal doors and frames receiving decorative metal cladding.
7. Division 08 Section "Louvers and Vents" for louvers made of formed metal.
8. Division 14 Section(s) "Electric Traction Elevators" and "Hydraulic Elevators" for elevator cab and entrance components made from sheet metal.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design exterior decorative formed metal items, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Decorative formed metal items, including anchors and connections, shall withstand the effects of gravity loads and the following loads and stresses without exceeding the allowable design working stress of materials involved and without exhibiting permanent deformation in any components:

1. Live Loads on Heating-Cooling Unit Enclosures: 100 lbf/sq. ft. (4.8 kN/sq. m) or a concentrated load of 300 lbf (1.3 kN) on an area of 4 sq. in. (26 sq. cm), whichever produces the greater stress.

C. Seismic Performance: Exterior decorative formed metal items, including anchors and connections, shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor is 1.0.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include finishing materials.

B. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.
2. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings: Show fabrication and installation details for decorative formed metal.

1. Include plans, elevations, component details, and attachments to other work.
2. Indicate materials and profiles of each decorative formed metal member, fittings, joinery, finishes, fasteners, anchorages, and accessory items.

D. Samples for Initial Selection: For products involving selection of color, texture, or design, including mechanical finishes.

E. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- (150-mm-) square Samples of metal of same thickness and material indicated for the Work.

F. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

G. Coordination Drawings: For decorative formed metal elements that house items specified in other Sections. Show dimensions of housed items, including locations of housing penetrations and attachments, and necessary clearances.

H. Qualification Data: For qualified professional engineer.

I. Mill Certificates: Signed by stainless-steel manufacturers certifying that products furnished comply with requirements.

J. Welding certificates.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing decorative formed metal similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Organic-Coating Applicator Qualifications: A firm experienced in successfully applying organic coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

C. Powder-Coating Applicator Qualifications: A firm experienced in successfully applying powder coatings of type indicated to metals of types indicated and that employs competent control personnel to conduct continuing, effective quality-control program to ensure compliance with requirements.

D. Installer Qualifications: Fabricator of products.

E. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.3, "Structural Welding Code - Sheet Steel."
4. AWS D1.6, "Structural Welding Code - Stainless Steel."

F. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups for the following types of decorative formed metal:

a. Heating unit enclosure

2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

G. Preinstallation Conference: Conduct conference at Project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver decorative formed metal products wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

B. Store products on elevated platforms in a dry location.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, beams, and other construction contiguous with decorative formed metal by field measurements before fabrication and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate installation of anchorages for decorative formed metal items. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Coordinate installation of decorative formed metal with adjacent construction to ensure that wall assemblies, flashings, trim, and joint sealants, are protected against damage from the effects of weather, age, corrosion, and other causes.

PART 2 - PRODUCTS

2.1 SHEET METAL

A. General: Provide sheet metal without pitting, seam marks, roller marks, stains, discolorations, or other imperfections where exposed to view on finished units.

B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

C. Aluminum Sheet: Flat sheet complying with ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H32.

D. Steel Sheet: electrolytic zinc-coated, ASTM A 879/A 879M, with steel sheet substrate complying with ASTM A 1008/A 1008M, commercial steel, exposed.

E. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, stretcher-leveled standard of flatness.

2.2 MISCELLANEOUS MATERIALS

A. Sealants, Interior: Nonsag, paintable, nonstaining, latex sealant complying with ASTM C 834; of type and grade required to seal joints in decorative formed metal; and as recommended in writing by decorative formed metal manufacturer.

1. Use sealant that has a VOC content of not more than 250 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting decorative formed metal items and for attaching them to other work unless otherwise indicated.

C. Structural Anchors: For applications indicated to comply with certain design loads, provide chemical or torque-controlled expansion anchors with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

D. Nonstructural Anchors: For applications not indicated to comply with design loads, provide powder-actuated fasteners metal expansion sleeve anchors or metal-impact expansion anchors of type, size, and material necessary for type of load and installation indicated, as recommended by manufacturer, unless otherwise indicated.

E. Anchor Materials:

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.

F. Sound-Deadening Materials:

1. Insulation: Unfaced, mineral-fiber blanket insulation complying with ASTM C 665, Type I, and passing ASTM E 136 test.
2. Mastic: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Backing Materials: Provided or recommended by decorative formed metal manufacturer.

H. Laminating Adhesive: Adhesive recommended by metal fabricator that will fully bond metal to metal and that will prevent telegraphing and oil canning and is compatible with substrate and noncombustible after curing.

1. Contact Adhesive: VOC content of not more than 80 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Metal-to-Metal Adhesive: VOC content of not more than 30 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Multipurpose Construction Adhesive: VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

4. Special-Purpose Contact Adhesive: (Contact adhesive used to bond melamine-covered board, metal, unsupported vinyl, ultrahigh molecular weight polyethylene, and rubber or wood veneer, 1/16 inch thick or less, to any surface): 250 g/L.

I. Isolation Coating: Manufacturer's standard epoxy coating.

2.3 PAINTS AND COATINGS

A. Shop Primers: Comply with Division 09 painting Sections.

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

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

2.4 FABRICATION, GENERAL

A. Shop Assembly: Preassemble decorative formed metal items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Coordinate dimensions and attachment methods of decorative formed metal items with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

C. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends. Fold back exposed edges of unsupported sheet metal to form a 1/2-inch- (12-mm-) wide hem on the concealed side, or ease edges to a radius of approximately 1/32 inch (1 mm) and support with concealed stiffeners.

D. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide surface flatness equivalent to stretcher-leveled standard of flatness and sufficient strength for indicated use.

1. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.

E. Build in straps, plates, and brackets as needed to support and anchor fabricated items to adjoining construction. Reinforce decorative formed metal items as needed to attach and support other construction.

F. Provide support framing, mounting and attachment clips, splice sleeves, fasteners, and accessories needed to install decorative formed metal items.

G. Where welding or brazing is indicated, weld or braze joints and seams continuously. Grind, fill, and dress to produce smooth, flush, exposed surfaces in which joints are not visible after finishing is completed.

1. Use welding and brazing procedures that will blend with and not cause discoloration of metal being joined.

2.5 CLOSURES AND TRIM

A. Form closures and trim from metal of type and thickness indicated below. Fabricate to fit tightly to adjoining construction.

1. Aluminum Sheet: Thickness required to comply with performance requirements.

a. Finish: High-performance organic coating in custom color per finish schedule

2. Steel Sheet: Thickness required to comply with performance requirements.

a. Finish: Powder coat.

3. Closures and trim may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view and not exposed to weather.

B. Conceal fasteners where possible; otherwise, locate where they are as inconspicuous as possible. Size fasteners to support closures and trim, with fasteners spaced to prevent buckling or waviness in finished surfaces.

C. Drill and tap holes needed for securing closures and trim to other surfaces.

D. Incorporate gaskets where indicated or needed for concealed, continuous seal at abutting surfaces.

E. Miter or cope trim members at corners and reinforce with bent metal splice plates to form tight joints.

2.6 ESCALATOR ENCLOSURES

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. Hi-Tech Metals, Inc.
2. KPK Stainless.
3. Metal Sales & Service, Inc.; Metalwerks Division.
4. Southwest Metalsmiths.
5. .

B. Form escalator enclosures from metal of type and thickness indicated below. Coordinate size of enclosures, location of cutouts, and method of attachment to adjoining construction.

1. Stainless-Steel Sheet: 0.062 inch (1.59 mm).

a. Finish: No. 6.

2.7 FILLER PANELS

A. Form filler panels for closing ends of partition systems and for other applications indicated. Form from two sheets of metal of type and thickness indicated below, separated by channels formed from the same material, producing a panel of same thickness as [**partitions**] [**mullions**] unless otherwise indicated. Incorporate reveals, trim, and concealed anchorages for attaching to adjacent surfaces.

1. Steel Sheet: 0.060 inch (1.52 mm).

    a. Finish: Powder coat.

2. Filler panels may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.

B. Fill interior of panel with sound-deadening insulation permanently attached to inside panel faces.

C. Adhesively attach gaskets to filler panel edges where they abut mullions or glazing. Use 1-inch- (25-mm-) square material, unless otherwise indicated, set approximately 1/4 inch (6 mm) into channeled edge of filler panel.

D. Attach gaskets to all edges of panels that abut adjacent surfaces to form a continuous seal. Use compressible gaskets or mastic sealing tape, applied to center of panel edges to be concealed from view, unless otherwise indicated.

E. Do not mechanically fasten filler panels to mullions.

2.8 HEATING-COOLING UNIT ENCLOSURES

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. Airflex Industries, Inc.
2. Architectural Grille; Div. of Giumenta Corp.
3. Arsco Manufacturing Company.
4. Kees, Inc.
5. Precision Metal Fabricators, Inc.

B. Fabricate heating-cooling unit enclosures from metal of type and thickness indicated below:

1. Steel Sheet:

    a. Framing: Thickness required to comply with performance requirements.
    b. Sills and Stools: Thickness required to comply with performance requirements.
    c. Front Panels and Bases: 0.060 inch (1.52 mm).
    d. Concealed Panels and Trim: 0.036 inch (0.91 mm).
    e. Finish: Powder coat.

C. Weld seams and connections unless otherwise indicated or unless other methods are necessary for access to heating and cooling equipment.

D. Incorporate stiffeners or laminated backing using noncombustible materials as needed for strength and rigidity.

1. Fill space between stiffeners with sound-deadening insulation attached to face sheet with insulation adhesive unless otherwise indicated.
2. Coat concealed faces of metal panels more than 6 inches (150 mm) wide with a heavy coating of sound-deadening mastic applied at the minimum rate of 20 sq. ft./gal. (0.5 sq. m/L).

E. Provide louvers and grilles of size, type, and materials indicated.

1. For removable grilles, use modular units with recessed openings formed into surfaces of enclosures and without blank filler panels between grilles, so face panels and stools are continuous. Fabricate removable grilles and openings to precise tolerances to produce well-fitted assemblies free of warp or rattle, with grilles supported continuously along parallel edges and with tops flush with top of enclosure.

F. Incorporate removable tops and fronts where indicated or needed for access to heating-cooling units and to piping, ductwork, controls, and electrical service, with panels and openings as follows:

1. Fabricate with a fitting tolerance of not less than 1/32 inch (0.8 mm) and not more than 1/16 inch (1.6 mm) at each edge, with face of panels flush with adjoining fixed surfaces of enclosure.
2. Form panels for easy removal without interfering with adjoining construction or furniture. Hold panels in place with concealed clips and hardware that prevent warp and rattle.

G. Incorporate hinged access panels in enclosures for access to heating-cooling unit controls, as either separate elements or integrated with grille openings, as indicated or needed.

H. Coordinate construction, configuration, and dimensions of enclosures with those of heating-cooling units. Provide support for heating-cooling units and controls where indicated. Provide blind knockouts and supports for piping, ductwork, control lines, electrical conduit, and wiring where indicated or needed.

I. Locate fixed surfaces of enclosure to coincide precisely with window mullions and partition system terminations. Provide closures at ends of units, at recessed openings in base of units, and at other locations where needed to conceal unfinished wall or floor surfaces, piping, conduit, ductwork, or heating-cooling units.

1. Provide built-in partitions (bulkheads) within enclosures between heating-cooling units, located to coincide with mullions and partition system terminations. Seal partitions to faces of enclosures with compressible gaskets or mastic sealing tape, and cover both sides of partitions with sound-deadening insulation attached to partitions with insulation adhesive.

2.9 METAL BASE

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

1. Fry Reglet Corporation.
2. Pittcon Industries.

B. Form metal base from metal of type and thickness indicated below:

1. Aluminum Sheet: 0.063 inch (1.60 mm).

a. Finish: High-performance organic coating.

2. Stainless-Steel Sheet: 0.050 inch (1.27 mm).

a. Finish: No. 6.

2.10 WALL PANELS

A. Form face sheet for wall panels from metal of type and thickness indicated below:

1. Aluminum Sheet: 0.040inch (1.60 mm).

a. Finish: High-performance organic coating in custom color per finish schedule.

2. Stainless-Steel Sheet: 0.040 inch (1.27 mm).

a. Finish: No. 4

2.11 WINDOW STOOLS

A. Form window stools from metal of type and thickness indicated below, with end closures:

1. Aluminum Sheet: 0.063 inch (1.60 mm).

a. Finish: High-performance organic coating.

B. Weld seams at end closures.

C. Braze seams at end closures.

D. Apply sound-deadening mastic to underside of window stools.

2.12 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

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

D. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

E. Finish items indicated on Drawings after assembly.

F. 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.

2.13 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. High-Performance Organic Finish: Three-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 50 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: Refer to finish schedule

2.14 STEEL SHEET FINISHES

A. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or with SSPC-SP 8, "Pickling."

B. Pretreatment: Immediately after cleaning, apply a conversion coating of type suited to organic coating applied over it.

C. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply shop primer to prepared surfaces of items unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

D. Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard thermosetting polyester or acrylic urethane powder coating with cured-film thickness not less than 1.5 mils (0.04 mm). Prepare, treat, and coat metal to comply with resin manufacturer's written instructions.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.15 STAINLESS-STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Directional Satin Finish: No. 4.

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 decorative formed metal.

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

3.2 INSTALLATION

A. Locate and place decorative formed metal items level and plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install decorative formed metal.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Install concealed gaskets, joint fillers, sealants, and insulation, as the Work progresses, to make interior decorative formed metal items soundproof or lightproof as applicable to type of fabrication indicated.

E. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

A. Unless otherwise indicated, clean metals by washing thoroughly with clean water and soap, rinsing with clean water, and drying with soft cloths.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09 painting Sections.

D. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes of decorative formed metal items from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 05 75 00

SECTION 05 81 00 – EXTERIOR WALL EXPANSION JOINTS

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: Provide expansion joints and accessories shown on the drawings or inferable therefrom and/or as specified, in accordance with the requirements of the Contract Documents.

1. Single Subcontract Responsibilities: Refer to Section 08 44 13, GLAZED ALUMINUM CURTAIN WALLS for the requirements of single subcontract responsibilities for expansion joints used in conjunction with the exterior wall curtain wall and metal panel cladding work.

1.2 SUBMITTALS

A. Manufacturer's Data: Submit copies of manufacturer's specifications and installation instructions, and other data as may be required to show compliance with these specifications.

B. Samples: Submit 12" long sample of each expansion joint required. Include splice and corner conditions.

1.3 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of vertical expansion joints under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by the joint manufacturer.

2. When joint substrates are damp, wet, or frozen.

1.4 DELIVERY AND STORAGE

A. Deliver materials in manufacturer's unopened containers, fully identified.

B. Store materials above grade and protect from the weather, soiling or damage from other sources. Store in accordance with manufacturer's instructions.

1.5 COORDINATION

A. Coordinate installation of exterior wall joint systems with roof expansion assemblies to ensure that wall transitions are watertight. Roof expansion assemblies are specified in Section 07 71 29, MANUFACTURED ROOF EXPANSION JOINTS.

PART 2 - PRODUCTS

2.1 GENERAL, SEAL FABRICATION

A. Expansion Joint Fabrication: Furnish the basic expansion joint profiles as shown on the drawings. Provide joints sized as required for the joint size and symmetry indicated, with the capacity to absorb variations in adjacent surfaces and structural movement. Furnish all straight run seals in single lengths to eliminate end joints.

B. Liquid Silicone Sealant: Provide liquid silicone sealant manufactured by the vertical expansion joint manufacturer that is manufactured from the same color batch as was used to form the silicone capping.

2.2 VERTICAL EXPANSION JOINTS

A. Description: A precompressed, self expanding foam expansion joint system for nominal joint openings indicated and located at exterior vertical wall cladding work. The joint system shall be composed of alternating laminations of an acrylic impregnated self expanding open cell foam sealant and closed cell (EVA) foam which are capped with a factory applied low modulus silicone color facing having a 15 Shore A hardness (per ASTM D2240). The joint system shall have a factory applied self adhesive on one side.

B. Physical Properties:

1. Movement Capability: +/- 50%. Expanding foam laminations shall be factory compressed 4-times to approximately 25% of fully expanded dimension.

2. Temperature Stability: Impregnated foam laminations to have tested stability over temperature range from -40 deg.F to 185 deg.F according to ASTM C711.

3. Staining: None per ASTM C510.

4. Xenon Arc Weatherometer: 2,000 hours no visible deterioration per ASTM G26.

5. Atlas Weatherometer: 6,000 hours minimal hardness change per ASTM G26.

6. Tensile Strength: 21 psi per ASTM D3574.

C. Manufacturer: Emseal Joint Systems, Ltd., Westborough, MA.

D. Products and Colors:

1. Seismic Colorseal, in manufacturers standard Gray color.

PART 3 - EXECUTION

3.1 CONDITION OF SUBSTRATE

A. Examine the substrate and conditions under which the expansion joints are to be installed. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of debris and deleterious material which would impair the work. Deleterious materials include surface dirt, rust, dampness, standing water, and frost.

B. Coordinate expansion joint work with the work of other trades.

3.3 INSTALLATION

A. General: Install all expansion joints in accordance with manufacturer's printed instructions, and as shown and required to prevent the transmission of water.

B Cutting, Fitting and Placement - Expanding Foam Sealants:

1. Perform all cutting and fitting required for the installation of the expansion joints.

2. Peel off release paper to exposed pressure sensitive adhesive on one face of material.

3. Push, do not pull or stretch, material into the joints indicated to receive them. Adhere expanding foam sealant to substrates by pressing the non adhesive side of the material toward the substrates.

4. End to end joints of consecutive lengths of material to be joined by mitering across the direction of expansion of the material (sizes above 2 ¾" can be butted, as opposed to mitered, together) and joined faces to be lightly "buttered" with liquid silicone sealant immediately after wiping the silicone capping with release agent. Apply sealant only to the cap facing edges.

5. Horizontal Joints: After the expansion joint has fully expanded install sealant fillet beads at all horizontal applications of the expansion joint. Gun a bead of liquid silicone sealant at the intersection of the cap facing to the adjacent substrates. Tool beads smooth.

3.4 PROTECTION

A. Protect expansion joint work from damage during construction.

END OF SECTION 05 81 00

SECTION 05 81 20 – INTERIOR ARCHITECTURAL EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes architectural joint systems for building interiors.

1.2 SUBMITTALS

A. Product Data: Submit product data including manufacturer's product specifications, construction details, material and finish descriptions, and dimensions of individual components and seals.

B. Shop Drawings: Submit shop drawings for each joint system specified:

1. Placement Drawings: Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

2. Architectural Joint System Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

a. Manufacturer and model number for each joint system.
b. Joint system location cross-referenced to Drawings.
c. Nominal joint width.
d. Movement capability.
e. Classification as thermal or seismic.
f. Materials, colors, and finishes.
g. Fire-resistance ratings.

C. Samples: Submit samples for each type of architectural joint system indicated.

1. Full width by 6 inches (150 mm) long, for each system required.

D. Product Test Reports: Submit product test reports for each specified expansion joint based on evaluation of comprehensive tests performed by a qualified testing agency, for current products.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain architectural joint systems through one source from a single manufacturer.

B. Accessibility Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1.

C. Fire-Test-Response Characteristics: Where indicated, provide architectural joint system and fire-barrier assemblies identical to those of assemblies tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

B. Elastomeric Seals: Preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required rating period.

D. Moisture Barrier: Flexible elastomeric material.

E. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.2 ARCHITECTURAL JOINT SYSTEMS, GENERAL

A. General: Provide architectural joint systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where joint changes direction or abuts other materials.
2. Include factory-fabricated closure materials and transition pieces, tee-joints, corners, cross-connections, and other accessories as required to provide continuous joint systems.

2.3 ARCHITECTURAL JOINT SYSTEMS FOR BUILDING INTERIORS

A. Type A: Model GFT-100 x 1-1/2”; C/S Group.

B. Type B: DSH System 1”; Emseal.

C. Type D: Model FWSC-200M, 232 white; C/S Group

D. Type E: Model FWF-300, 232 white; C/S Group

E. Type F: Model FWSC-300M, 232 white; C/S Group

F. Type F1: Model FWSC-300, 232 white; C/S Group

G. Type G: Migutrans FS 130/4200; Emseal.

H. Type J: Model FWSC-500M, 232 white; C/S Group

I. Type K: Model FWF-500, 232 white; C/S Group

J. Type L: Model FCF-500, 232 white; C/S Group

K. Type M: Model FWF-800, 232 white; C/S Group

L. Type M1: Model FWFC-800M, 232 white; C/S Group

M. Type N: Model FCF-800, 232 white; C/S Group

N. Type P: Model AFW-6; C/S Group

O. Type R: Model SF-600, 232 white; C/S Group

P. Type R1: Model FWF-600, 232 white; C/S Group

Q. Type R2: Model FWC-600M, 232 white; C/S Group

R. Type X: Model BJR-400; C/S Group

S. Type X1: Model BRJW-400, 232 white; C/S Group

T. Type Y: No expansion joint, provide 2 hour fire barrier. C/S Group

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and blockouts where architectural joint systems will be installed for installation tolerances and other conditions affecting performance of work.

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

3.2 PREPARATION

A. Prepare substrates according to architectural joint system manufacturer's written instructions.

B. Repair concrete slabs and blockouts using manufacturer's recommended repair grout of compressive strength adequate for anticipated structural loadings.

C. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

D. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing architectural joint assemblies and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install joint systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper joint installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.
4. Locate in continuous contact with adjacent surfaces.
5. Shim to level where required. Support underside of frames continuously to prevent vertical deflection when in service.
6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Terminate exposed ends of joint assemblies with field- or factory-fabricated termination devices.

E. Fire-Resistance-Rated Assemblies: Coordinate installation of architectural joint assembly materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 05 81 20

SECTION 06 10 53 - MISCELLANEOUS ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes miscellaneous carpentry.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of fire-retardant treated wood product from one source for both treatment and fire retardant formulation.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber and plywood; place spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

1.5 LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Certificates for Credit MR 6 AND MR 7: 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. Include statement indicating costs for each certified wood product.

5. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
6. Product Data for Credit EQ 4.4: For composite-wood products, documentation indicating that product contains no urea formaldehyde

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by the American Lumber Standards Committee Board of Review.

1. Factory mark each piece of lumber with grade stamp of grading agency that identifies the grading agency, grade species, moisture content at time of surfacing, and mill.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.
4. Provide dry lumber with 19 percent maximum moisture content at time of dressing for 2-inch nominal (38-mm actual) thickness or less, unless otherwise indicated.

B. Wood Panels:

1. Plywood: Comply with DOC PS 1. Furnish panels that are each factory marked with APA trademark evidencing compliance with grade requirements.
2. Thickness: As needed to comply with requirements specified but not less than thickness indicated.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: Where lumber or plywood is indicated to be preservative treated or is specified to be treated, comply with the applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the SPIB Quality Mark Requirements.

1. Preservative Chemicals: Alkali-based (amine/ammonia) copper quat (ACQ) or chromated copper arsenate (CCA).

B. Pressure treat above ground items with waterborne preservatives to comply with AWPA P5 for retention, penetration and other requirements applicable to the species, product, treatment and condition of the use specified and shown. Complete fabrication of treated items prior to treatment, where possible.

1. Treatment and Retention Level: Using either ACQ or CCA chemicals for Southern Pine, the required preservative retention shall be 0.25 lbs./cubic foot.

C. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Inspect each piece of lumber and plywood after drying and discard damaged or defective pieces. Treat items indicated on Drawings, and the following:

1. Wood nailers, curbs, equipment support bases, blocking, plywood sheathing, and similar members in connection with roofing, flashing, and waterproofing.
2. Wood blocking, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Provide chemical fire retardant process tested and labeled “FR-S” by Underwriters Laboratories with flame spread and smoke developed ratings of 25 or less. Comply with AWPA C20 (lumber) and AWPA C27 (plywood) for Interior Type A High Temperature (HT) as a minimum for treatment. Identify fire-retardant-treated wood with appropriate classification marking of UL.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Product Reference: “Dricon”; Hickson Corp.

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Inspect each piece of lumber and plywood after drying and discard damaged or defective pieces. Treat items indicated on Drawings, and the following:

1. Wood members required to be treated by the Building Code having jurisdiction at the site and wood members shown or specified as Fire Retardant Treated.

2.4 MISCELLANEOUS LUMBER

A. General: Provide lumber for support or attachment of other construction; including rooftop equipment bases and support curbs, blocking, nailers, dumpster and generator screen enclosures and gates.

B. For items of dimension lumber size, provide mixed southern pine complying with SPIB No. 2 Grade of Better lumber with 19 percent maximum moisture content.

2.5 PANEL PRODUCTS

A. Telephone, Electrical, Data, Security System Equipment, and Mirror Backing Panels: Provide DOC PS 1, Exposure 1, APA C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 15/32 inch thick.

B. Plywood Toilet Room and Lavatory Countertop Backing Panels: Provide DOC PS 1, Exposure 1, APA C-D, preservative treated, in thickness indicated or, if not indicated, not less than 25/32 inch thick.

C. Plywood Sheathing: APA Rated Plywood Sheathing, Exposure 1 Durability Classification, 32/16 span index, preservative treated, in thickness indicated or, if not indicated, not less than 15/32 inch thick at vertical applications and 25/32" inch thick at horizontal applications; square edged.

2.6 FASTENERS

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

1. Where carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Wire, Brads, and Staples: FS FF-N-105, type and size best suited for purpose.

C. Power-Driven Fasteners: CABO NER-272, type and size best suited for purpose.

D. Wood Screws: ASME B18.6.1, type and size best suited for purpose.

E. Lag Bolts: ASME B18.2.1. (ASME B18.2.3.8M), type and size best suited for purpose.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers, type and size best suited for purpose.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Discard units of material with defects that impair quality of carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.

B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Apply field treatment complying with AWPA M4 to cut surfaces of preservative-treated lumber and plywood.

D. Securely attach carpentry work as indicated and according to applicable codes and recognized standards.

E. Use fasteners of appropriate type and length. Predrill members when necessary to avoid splitting wood.

3.2 WOOD BLOCKING AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces.

3.3 PANEL PRODUCT INSTALLATION

A. Comply with applicable recommendations contained in APA Form No. E30K, "APA Design/Construction Guide: Residential & Commercial," for types of panels and applications indicated and local utility requirements.

B. Fastening Methods: Fasten panels as indicated below:

1. Toilet Room and Lavatory Countertops: Bolt to steel framing.

2. Plywood Backing Panels: Secure to wall using proper fastening devices for substrates encountered spaced 12" o.c. maximum at perimeter 1/2" from corners and three rows of 3 fasteners each in the backerboard field. Countersink fasteners flush with plywood surface. Butt adjacent panels without lapping.

3. Plywood Sheathing Application: Cover sheathing support framing with plywood sheathing and fasten to supports with power driven, winged reamer screw fasteners spaced 6" o.c. along supported panel edges and 12” o.c. for intermediate supports.

END OF SECTION 06 10 53

SECTION 06 15 00 - WOOD DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Solid-sawn wood roof decking.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with wood decking.
2. Division 06 Section "Exterior Rough Carpentry" for wood decking for elevated decks.

1.3 SUBMITTALS

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

1. For glued-laminated wood decking, include installation instructions and data on lumber, adhesives, and fabrication.
2. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood used for decking complies with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

    a. Include statement indicating costs for each certified wood product.

2. Product Data for Credit EQ 4.1: For sealants and installation adhesives, including printed statement of VOC content.
3. Product Data for Credit EQ 4.4: For laminating adhesive used for glued-laminated decking, indicating that product contains no urea formaldehyde.

C. Samples: 24 inches long, showing the range of variation to be expected in appearance of wood decking.

1.4 QUALITY ASSURANCE

A. Standard for Solid-Sawn Wood Decking: Comply with AITC 112.

B. Forest Certification: Provide wood decking 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."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Schedule delivery of wood decking to avoid extended on-site storage and to avoid delaying the Work.

B. Store materials under cover and protected from weather and contact with damp or wet surfaces. Provide for air circulation within and around stacks and under temporary coverings. Stack wood decking with surfaces that are to be exposed in the final Work protected from exposure to sunlight.

PART 2 - PRODUCTS

2.1 WOOD DECKING, GENERAL

A. General: Comply with DOC PS 20 and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.

B. Moisture Content: Provide wood decking with 15 percent maximum moisture content at time of dressing.

2.2 SOLID-SAWN WOOD DECKING

A. Decking Species: Southern pine.

B. Decking Nominal Size: As indicated.

C. Decking Grade: As indicated.

D. Grade Stamps: Factory mark each item with grade stamp of grading agency. Apply grade stamp to surfaces that will not be exposed to view.

E. Face Surface: Smooth.

F. Edge Pattern: Vee grooved.

G. Preservative Treatment: Pressure treat solid-sawn wood decking according to AWPA C31 with inorganic boron (SBX) and redry wood to 15 percent maximum moisture content.

2.3 ACCESSORY MATERIALS

A. Fasteners for Solid-Sawn Decking: Provide fastener size and type complying with decking standard for thickness of deck used.

B. Fasteners for Glued-Laminated Decking: Provide fastener size and type complying with requirements in "Installation" Article for installing laminated decking.

C. Nails: Common; complying with ASTM F 1667, Type I, Style 10.

D. Spikes: Round; complying with ASTM F 1667, Type III, Style 3.

E. Fastener Material: Hot-dip galvanized steel.

F. Bolts for Anchoring Decking to Walls: Carbon steel; complying with ASTM A 307 with ASTM A 563/A 563M hex nuts and, where indicated, flat washers, all hot-dip zinc coated.

G. Installation Adhesive: For wood decking indicated to be of diaphragm design and construction, provide adhesive that complies with research/evaluation report.

1. Use adhesive that has a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

H. Penetrating Sealer: Clear sanding sealer complying with Division 09 Section "Staining and Transparent Finishing" and compatible with topcoats specified for use over it.

2.4 FABRICATION

A. Shop Fabrication: Where preservative-treated decking is indicated, complete cutting, trimming, surfacing, and sanding before treating.

B. Predrill decking for lateral spiking to adjacent units to comply with referenced decking standard.

C. Seal Coat: After fabricating and surfacing decking, apply a saturation coat of penetrating sealer in fabrication shop.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls and support framing in areas to receive wood decking for compliance with installation tolerances and other conditions affecting performance of wood decking.

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

3.2 INSTALLATION

A. Install solid-sawn wood decking to comply with referenced decking standard.

1. Locate end joints for controlled random lay-up.

B. Install wood decking to comply with manufacturer's written instructions.

1. Nail each course of glued-laminated wood decking at each support with one nail slant nailed above the tongue and one nail straight nailed through the face.
   a. Use 30d nails for 3x6 and 3x8 decking.

2. Slant nail each course of wood decking to the tongue of the adjacent course at 30 inches o.c. and within 12 inches of the end of each unit. Stagger nailing in adjacent courses 15 inches.

   a. Use 8d nails for 3x6 and 3x8 decking.

3. Glue adjoining decking courses together by applying a 3/8-inch bead of adhesive on the top of tongues according to research/evaluation report.

C. Anchor wood roof decking, where supported on walls, with bolts as indicated.

D. Where preservative-treated decking must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

1. For solid-sawn decking, use inorganic boron (SBX).
2. For laminated decking, use copper naphthenate.

E. Apply joint sealant to seal roof decking at exterior walls at the following locations:

1. Between decking and supports located at exterior walls.
2. Between decking and exterior walls that butt against underside of decking.
3. Between tongues and grooves of decking over exterior walls and supports at exterior walls.

3.3 ADJUSTING

A. Repair damaged surfaces and finishes after completing erection. Replace damaged decking if repairs are not approved by Architect.

3.4 PROTECTION

A. Provide temporary waterproof covering as the Work progresses to protect roof decking until roofing is applied.

END OF SECTION 06 15 00

SECTION 06 18 00 - GLUED-LAMINATED CONSTRUCTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes framing using structural glued-laminated timber.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for dimension lumber items associated with structural glued-laminated timber.
2. Division 06 Section "Wood Decking" for wood roof decking.

1.3 DEFINITIONS

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

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design structural glued-laminated timber and connectors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Structural glued-laminated timber and connectors shall withstand the effects of structural loads shown on Drawings without exceeding allowable design working stresses listed in AITC 117 or determined according to ASTM D 3737 and acceptable to authorities having jurisdiction.

C. Seismic Performance: Structural glued-laminated timber and connectors shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1.5 SUBMITTALS

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

1. Include data on lumber, adhesives, fabrication, and protection.

2. For preservative-treated wood products, include chemical treatment manufacturer's written instructions for handling, storing, installing, and finishing treated material.
3. For connectors, include installation instructions.

B. LEED Submittals:

1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood used for structural glued-laminated timber complies with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

a. Include statement indicating costs for each certified wood product.

2. Product Data for Credit EQ 4.4: For laminating adhesive used for structural glued-laminated timber, indicating that product contains no urea formaldehyde.

C. Shop Drawings:

1. Show layout of structural glued-laminated timber system and full dimensions of each member.
2. Indicate species and laminating combination, adhesive type, and other variables in required work.
3. Include large-scale details of connections.

D. Samples: Full width and depth, 24 inches long, showing the range of variation to be expected in appearance of structural glued-laminated timber, including variations due to specified treatment.

1. Apply specified factory finish to three sides of half length of each Sample.

E. Delegated-Design Submittal: For structural glued-laminated timber and timber connectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

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

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

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide factory-glued structural units produced by an AITC- or APA-licensed firm that is certified for chain of custody by an FSC-accredited certification body.

1. Factory mark each piece of structural glued-laminated timber with AITC Quality Mark or APA-EWS trademark. Place mark on surfaces that will not be exposed in the completed Work.

B. Quality Standard: Comply with AITC A190.1.

C. Forest Certification: Provide structural glued-laminated timber 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."

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with provisions in AITC 111.

B. Individually wrap members using plastic-coated paper covering with water-resistant seams.

PART 2 - PRODUCTS

2.1 STRUCTURAL GLUED-LAMINATED TIMBER

A. General: Provide structural glued-laminated timber that complies with AITC 117 or research/evaluation reports acceptable to authorities having jurisdiction.

1. Provide structural glued-laminated timber made from single species.
2. Provide structural glued-laminated timber made from solid lumber laminations; do not use laminated veneer lumber.
3. Provide structural glued-laminated timber made with wet-use adhesive complying with AITC A190.1.

    a. Use adhesive that contains no urea-formaldehyde resins.

B. Species and Grades for Structural Glued-Laminated Timber: Southern pine in grades needed to comply with "Performance Requirements" Article.

C. Appearance Grade: Premium, complying with AITC 110.

1. For Premium and Architectural appearance grades, fill voids as required by AITC 110. For Premium appearance grade, use clear wood inserts, of matching grain and color, for filling voids and knot holes more than 1/4 inch wide.

D. Preservative Treatment after Fabrication: Where preservative-treated structural glued-laminated timber is indicated, pressure treat after fabrication according to AWPA C28.

E. Preservative Treatment before Fabrication: Where preservative-treated structural glued-laminated timber is indicated, pressure treat lumber before gluing according to AWPA C28.

F. End Sealer: Manufacturer's standard, transparent, colorless wood sealer that is effective in retarding the transmission of moisture at cross-grain cuts and is compatible with indicated finish.

G. Penetrating Sealer: Manufacturer's standard, transparent, penetrating wood sealer that is compatible with indicated finish.

2.2 TIMBER CONNECTORS

A. General: Unless otherwise indicated, fabricate from the following materials:

1. Structural-steel shapes, plates, and flat bars complying with ASTM A 36/A 36M.
2. Round steel bars complying with ASTM A 575, Grade M 1020.
3. Hot-rolled steel sheet complying with ASTM A 1011/A 1011M, Structural Steel, Type SS, Grade 33.

B. Fabricate beam hangers from steel as indicated.

C. Fabricate strap ties from steel, as indicated.

D. Fabricate tie rods from round steel bars with upset threads connected with forged-steel turnbuckles complying with ASTM A 668/A 668M.

E. Provide bolts, 3/4 inch unless otherwise indicated, complying with ASTM A 307, Grade A; nuts complying with ASTM A 563; and, where indicated, flat washers.

F. Provide shear plates, as indiated, complying with ASTM D 5933.

G. Finish steel assemblies and fasteners with rust-inhibitive primer, 2-mil dry film thickness.

H. Hot-dip galvanize steel assemblies and fasteners after fabrication to comply with ASTM A 123/A 123M or ASTM A 153/A 153M.

2.3 FABRICATION

A. Shop fabricate for connections to greatest extent possible, including cutting to length and drilling bolt holes.

1. Dress exposed surfaces as needed to remove planing and surfacing marks.

B. Camber: Fabricate horizontal and inclined members of less than 1:1 slope with either circular or parabolic camber equal to 1/500 of span.

C. End-Cut Sealing: Immediately after end cutting each member to final length and after preservative treatment, apply a saturation coat of end sealer to ends and other cross-cut surfaces, keeping surfaces flood coated for not less than 10 minutes.

D. Seal Coat: After fabricating, sanding, and end-coat sealing, apply a heavy saturation coat of penetrating sealer on surfaces of each unit, except for preservative-treated wood where treatment included a water repellent.

2.4 FACTORY FINISHING

A. Wiped Stain Finish: Manufacturer's standard, dry-appearance, penetrating acrylic stain and sealer; oven dried and resistant to mildew and fungus.

1. Color: As selected by Architect from manufacturer's full range.

B. Clear Finish: Manufacturer's standard, two-coat, clear varnish finish; resistant to mildew and fungus.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates in areas to receive structural glued-laminated timber, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of structural glued-laminated timber.

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

3.2 INSTALLATION

A. General: Erect structural glued-laminated timber true and plumb, and with uniform, close-fitting joints. Provide temporary bracing to maintain lines and levels until permanent supporting members are in place.

1. Lift with padded slings and protect corners with wood blocking.
2. Install structural glued-laminated timber to comply with Shop Drawings.
3. Install timber connectors as indicated.

B. Fit structural glued-laminated timber by cutting and restoring exposed surfaces to match specified surfacing and finishing.

1. Predrill for fasteners using timber connectors as templates.
2. Dress exposed surfaces as needed to remove planing and surfacing marks.
3. Coat cross cuts with end sealer.
4. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
    b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

C. Cutting: Avoid cutting after fabrication. Where field fitting is unavoidable, comply with requirements for shop fabrication.

1. Where preservative-treated members must be cut during erection, apply a field-treatment preservative to comply with AWPA M4.

    a. Use inorganic boron (SBX) treatment for members not in contact with the ground and continuously protected from liquid water.
    b. Use copper naphthenate treatment for members in contact with the ground or not continuously protected from liquid water.

3.3 ADJUSTING

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

3.4 PROTECTION

A. Do not remove wrappings on individually wrapped members until they no longer serve a useful purpose including protection from weather, sunlight, soiling, and damage from work of other trades.

1. Coordinate wrapping removal with finishing work specified in Division 09. Retain wrapping where it can serve as a painting shield.
2. Slit underside of wrapping to prevent accumulation of moisture inside the wrapping.

END OF SECTION 06 18 00

SECTION 06 26 14 - SOLID MINERAL PROFILE PANELING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes: Solid mineral profile paneling and seam finishing materials to create a monolithic sculptured wall surface.

B. Products Supplied But Not Installed/Used Under This Section: Following components of Installation Kit:
   1. Dry Mix Joint Compound.
   2. Acrylic Fortifier.
   3. Low-VOC Adhesive.
   4. Low- VOC Primer Sealer.

C. Related Sections:
   1. 09 91 00–Painting: Sealing and painting of profile paneling.

1.02 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D 256 Standard Test Methods for Determining the Izod Pendulum Impact Resistance of Plastics.
   2. ASTM D 638 Standard Test Method for Tensile Properties of Plastics.
   3. ASTM D 696 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between -30°C and 30°C With a Vitreous Silica Dilatometer.
   4. ASTM D 790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
   5. ASTM D 2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
   6. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SUBMITTALS

A. Reference Section 01 33 00–Submittal Procedures; submit following items:
   1. Product Data.
   2. Project List: Minimum 5 previous completed projects including contact name and e-mail address or telephone number for each project.
   3. Shop Drawings: Standard installation details.
   4. Samples: Minimum 15 by 15 inch solid mineral panel of specified design(s).
   5. Quality Assurance/Control Submittals:
      a. Qualifications: Proof of manufacturer, installer, and finisher qualifications.
      b. Manufacturer’s Installation Instructions.

B. Submittals for LEED-NC:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.1: For adhesives used to laminate panels to substrates, including printed statement of VOC content.

1.04 QUALITY ASSURANCE

A. Qualifications:
    1. Manufacturer Qualifications: Minimum five years experience in producing mineral profile paneling.
    2. Installer Qualifications: Minimum three years experience in finish carpentry/architectural woodwork installation.

B. Field Samples: Provide in a location selected by Architect showing representative sample of installed product including finished seam.
    1. Reference Section 01 45 00–Quality Control.
    2. Minimum Size: 8 by 8 feet
    3. Approved field samples may remain as part of completed Work.

C. Pre-Installation Meeting:
    1. Convene meeting at project site within one week of scheduled start of installation with representatives of the following in attendance: Owner, Architect, General Contractor, Installer, Finisher, and Painter.
    2. Review substrate conditions, requirements of related work, installation, seam finishing, and painting instructions, and storage and handling procedures.
    3. Keep minutes of meeting including responsibilities of various parties and deviations from specifications and installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Follow manufacturer’s instructions.
    1. Store panels in fully enclosed space, protected against damage from moisture, direct sunlight, and surface contamination.
    2. Store panels vertically, in shipping crates, until ready to be installed. Loosen crate lids to allow for venting. Do not stack or lean against walls.
    3. Store panels in area of installation minimum 24 hours prior to installation.

1.06 PROJECT/SITE CONDITIONS

A. Environmental Requirements for Installation:
   1. HVAC: Operate HVAC system to maintain occupancy level temperature and relative humidity conditions (35 to 67 percent) in the area of installation from 24 hours prior to delivery of panels to the installation area through remainder of construction period.
   2. Lighting: Permanent project lighting, including any special lighting used to highlight the profiled panels, must be operational prior to seam finishing.

1.07 SEQUENCING

A. Seam Finishing: Depending on scheduling of other Work, seam finishing may be required after completion of other gypsum board finishing work.

B. Lighting: Permanent project lighting must be installed and be operational prior seam finishing.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Modular Arts, Inc.
4215 - 23rd Avenue West
Seattle, WA 98199

Tel: 206.788.4210
Fax: 206.788.4214
E-mail: info@modularArts.com
Website: www.modularArts.com

B. Product: Modular Arts Solid Mineral Profile Paneling.
   1. Design: Flo© ; horizontal orientation.
      Note: Modular Arts designs are protected by registered copyrights and may not be duplicated. Attempts to copy or closely mimic Modular Arts original designs will be considered a violation of intellectual property rights and will be duly pursued.

C. Substitutions: None permitted.

2.02 MATERIALS

A. Profile Panel: 32 by 32 by 1 inch maximum profile relief, smooth surface solid mineral composite panel containing no retardants, accelerators, release agents, or plastics.
   1. Physical Properties:

a.	Tensile Strength: ASTM D 638	960 psi.
b.	Modulus of Elasticity: ASTM D 638	1970 ksi.
c.	Flexural Strength: ASTM D 790	550 psi.
d.	Flexural Modulus: ASTM D 790	360 ksi.
e.	Izod Impact Strength: ASTM D 256	9.4 ft-lb/in^2.
f.	Hardness: ASTM D 2583	60 Barcol.
g.	Thermal Expansion: ASTM D 696	3.8x10^{-7}in/in °F.
h.	Compressive Strength: ASTM D 696	2.3 ksi.
i.	Flame Spread Index: ASTM E 84	0
j.	Smoke Development Index: ASTM E 84	0
k.	Weight	2.5 psf

B. Installation Kit:

1. Dry Mix Joint Compound: BEADEX® brand SILVER SET™ 40, or SHEETROCK® brand EASY SAND™ 45.
2. Acrylic Fortifier: THORO® ACRYL 60®.
3. Construction Adhesive: PL® Polyurethane Premium Construction Adhesive.
4. Primer Sealer: RODDA PAINT HORIZON Interior Wall Sealer No. 5035011.

2.03 SOURCE QUALITY CONTROL

A. Fabrication Tolerances:
   1. Dimensions, length and width: +/- 1/16 inch.
   2. Thickness: +/- 1/16 inch.
   3. Weight: +/- 0.5 lb

PART 3 - EXECUTION

3.01 EXAMINATION

A. Examine substrates upon which profile paneling will be installed.
   1. Verify that substrate is a material listed as an acceptable substrate by the profile paneling manufacturer.

B. Verify that permanent project lighting is in place and operational prior to start of seam finishing.

C. Coordinate with responsible entity to correct unsatisfactory conditions.

D. Commencement of work by installer is acceptance of substrate conditions.

3.02 INSTALLATION

A. Install profile paneling in accordance with Manufacturer's Installation Instructions except that seam finishing shall be performed under Section 09 29 00–Gypsum Board, and sealing and painting shall be performed under Section 09 91 00–Painting.

3.03 CLEANING

A. Clean per manufacturer’s written instructions.

END OF SECTION

SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes interior architectural woodwork.

1. The extent of the interior architectural woodwork is indicated on the drawings as ‘millwork’ and ‘woodwork’.

1.2 SUBMITTALS

A. Product Data: Submit product data for each material and product specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.

B. Shop Drawings: Submit shop drawings showing locations of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components. Elevations shall be drawn at a scale of not less than 1/2" = 1'-0". Details shall be drawn at a scale of not less than 3" = 1'-0".

1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
2. Show locations and sizes of cutouts and holes for plumbing, electrical, computer and telephone equipment and other items installed in architectural woodwork.
3. Show coating direction orientation for each solid laminate (Trespa) panel.

C. Samples: Submit samples of the following:

1. Three 12” x 12” sample sets containing a minimum of 2 or more samples of plastic laminate veneered panel products, fabricated from each core product, for each veneer specified and demonstrating the proposed full range of appearance characteristics to be expected in completed work. Include at least one face-veneer seam in each sample.
2. Solid-surfacing materials, 6 inches (150 mm) square.
3. Lumber products with shop-applied opaque finish, for each finish system and color, with exposed surface finished.
4. Thermoset decorative-overlay surfaced panel products, for each type, color, pattern, and surface finish.
5. Cabinet Locks: Three samples of each type.
6. Stainless Steel Trim Shapes: Three samples of each type and finish, 12" long.
7. Submit samples of each type of door specified showing construction and finishes selected. Samples shall be 12" x 12" corner section.

D. LEED Submittals:

1. Product Data for Credit EQ 4.1: For installation adhesives, including printed statement of VOC content.

2. Product Data for Credit EQ 4.4:

   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.

3. Product Data for Credit(s) MR 4.1: 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.

4. Certificates for Credit MR 7: 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.

1.3 QUALITY ASSURANCE

A. Single-Source Manufacturing and Installation Responsibility: Engage a qualified Manufacturer - acceptable to the Architect - to assume undivided responsibility for woodwork specified in this section, including fabrication, finishing, and installation. The manufacturer shall have had a minimum of 15 years successful experience in the custom fabrication and installation of architectural woodwork comparable to that shown and specified, be a member of the AWI, maintain an organized quality control program, perform its own in-house veneer lay-up work, and who retains facilities with sufficient capacity and quality to produce the required architectural woodwork without causing delay to the project.

B. Quality Standard: Fabricate and install all architectural woodwork in accordance with the applicable requirements of "Architectural Woodwork Quality Standards" 8th Edition, Version 1.0, published by the Architectural Woodwork Institute (AWI) unless more stringent requirements are specified or shown.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration. Do not deliver woodwork until painting, wet work, grinding, and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions" Article.

1.5 PROJECT CONDITIONS

A. Environmental Conditions: Obtain and comply with Woodwork Manufacturer's advice for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized so that woodwork is within plus or minus 1.0 percent of optimum moisture content from date of installation through remainder of construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify actual dimensions of other construction by accurate field measurements before fabrication of woodwork; and indicate measurements on final Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.
2. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

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

1.7 PRE-INSTALLATION COORDINATION MEETING

A. Meet at the project site, prior to installation of architectural woodwork, to review the substrate preparation, installation and coordination with other trades, special details and conditions, and other topics related to the architectural woodwork. The preinstallation meeting shall include the Architect, the Contractor, architectural woodworker, and any subcontractors affected by the architectural woodwork installation.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade specified.

B. Lumber Standards: Comply with applicable provisions for grading and workmanship of AWI Quality Standards, Sections 100-S-1, 100-S-4, 100-S-5, Grade I and the requirements shown and specified, where standards conflict the more stringent shall apply. Provide lumber surfaced 4 sides (S4S) and fabricated to profiles shown. All lumber shall be kiln dried to the moisture content indicated in AWI Section 100-S-11.

1. Furring, Blocking, Shims: No. 1 Common; Southern Pine.

2. Solid Hardwood for Opaque Finish: Plain sawn Yellow Poplar, free from checks, splits, sound knots.

C. Hardboard: AHA A135.4.

D. Medium Density Fiberboard and Particleboard: One of the following:

1. Industrial Grade Medium Density Fiberboard (MDF): Comply with ANSI A208.2, Classification MD, minimum 45 pcf density except that minimums for screw-holding capacity on edge and face shall be 225 pounds and 300 pounds, respectively; minimum 3/4" thick, edged and faced as specified, fabricated with formaldehyde free resins.

a. Product Reference: Medex, or Medite II; SierraPine.

2. Medium Density Particleboard: Comply with ANSI A208.1, M2-Exterior Glue composed of phenolic resins and waxes, with a minimum 45 pcf density; minimum 3/4" thick, internal bond of 170 psi, edge screw pull out of 250 pounds, face screw pull out of 350 pounds, Class 3 or C flammability per ASTM E84, edged and faced as specified and manufactured from 100% post industrial recycled woods and resins free of urea-formaldehyde.

a. Product Reference: Resin Core 1; Rodman Industries, Inc., Oconomowoc, WI.

E. Thermoset Decorative Overlay (Melamine): Particleboard complying with ANSI A208.1, Grade M-2, or medium-density fiberboard complying with ANSI A208.2, Grade MD, with surface of thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

1. Types: As indicated on the drawings.

F. High-Pressure Decorative Laminate: NEMA LD 3, general purpose grade plastic laminate, minimum 1 mm thick.

1. Types: Refer to Finish Materials Schedule Drawing

2. Backing sheets: Non-decorative, high pressure laminate, NEMA LD3, Grade, types and thickness to match face sheets and equalize pull.

G. Solid-Surfacing Material: Provide material that meets or exceeds ISSFA -2-01 performance standards, consisting of reacted monomers and resins, mineral fillers and pigments and manufactured in sheets of specific thicknesses. Solid surfacing material shall be solid, non-porous, homogeneous, hygienic, renewable, and, when applicable, may feature inconspicuous hygienic seams. Solid surfacing material shall be free from conspicuous internal strengthening fibers.

1. Types: Solid Surfacing to match Architect’s solid surface material samples; Formica Corporation or approved equal.

2. Adhesives: Use low emitting, formaldehyde free, adhesives which leave no glue lines on finished surfaces of architectural woodwork.

H. Solid Phenolic Millwork Panels:

1. Manufacturer: Trespa North America, or approved equal. Contact: Trespa North America, 12267 Crosthwaite Circle, Poway, CA 92064; Telephone: (800) 487-3772

2. Millwork Panel: Trespa Virtuon
   a. Material: Solid phenolic wall panel.
   b. Color and Pattern: White
   c. Panel Core: Standard black core
   e. Panel Thickness: 3/8 inch (10 mm)
   f. Modulus of Elasticity: 1,500,000 psi (10,335 MPa) minimum per DIN 53457.
   g. Tensile Strength: 13,000 psi (90 MPa) per DIN 53455.
   h. Flexural Strength: 14,500 psi (100 MPa) minimum per DIN 53452.
   i. Surface Impact Resistance: 4 index minimum per EN 438-2 (11).
   j. Scratch Resistance: 4 index minimum per EN 438-2 (14).
   k. Anti-Static Properties: Anti-static per DIN 51 953 and DIN 53 482.
   l. Flamespread index of 10 perASTM E84
   m. Smoke developed index of 45 - 75 per ASTM E84.
   n. Water Absorption: Less than 1.0% per EN 438-2 (7).
   o. Porosity: Nonporous surface and edges.
   p. Microbial Characteristics: Will not support microorganic growth.
   q. Sanitation Characteristics: Suitable for FDA food preparation environments.
   r. Cleanability: Resists dirt pickup. Easily cleaned.

2.2 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where indicated, use materials impregnated with fire-retardant chemical formulations indicated by a pressure process or other means acceptable to authorities having jurisdiction to produce products with fire-test-response characteristics specified.

1. Do not use treated material that does not comply with requirements of referenced woodworking standard or that is warped, discolored, or otherwise defective.
2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants in solution to distinguish treated material from untreated material.
3. Treat only door subframing, blocking and furring items.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Comply with AWPA C20 (lumber) and AWPA C27 (plywood), for woodwork items indicated as fire-retardant treated. Use the following treatment type:

1. Interior Type A: Low-hygroscopic formulation.
2. Mill lumber after treatment, within limits set for wood removal that does not affect listed fire performance characteristics, using a woodworking plant certified by testing and inspecting organization.
3. Kiln-dry woodwork after treatment to levels required for untreated woodwork.
4. Discard treated lumber that does not comply with requirements of referenced woodworking standard. Do not use twisted, warped, bowed, discolored, or otherwise damaged or defective lumber.

C. Fire Performance Characteristics: Provide materials identical to those tested for the following fire performance characteristics per ASTM test methods indicated by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify treated lumber with classification marking of inspecting and testing organization in the form of separable paper label or, where required by authorities having jurisdiction, of imprint on lumber surfaces that will be concealed from view after installation.Surface Burning Characteristics: Not exceeding a flame spread of 25, and smoke developed of 50 when tested per ASTM E84 for 30 minutes.

2.3 ACCESSORY MATERIALS

A. Cabinet Door Hinges: Concealed all-metal furniture hinges similar to Grass 3000 Series or equal with free swing only at cabinet doors that are provided with magnetic latches**,** adaptable or engineered for 35 mm hinge cup boring pattern, with minimum 165 degree opening angle, 3 dimensional hinge having adjustments located in the steel hinge arm, steel or die-cast zinc hinge cups, and plastic insertion dowels to receive hinge screws. Automatic closing shall engage only in the last 10 degrees of swing. All hinge pins and linkages shall be hardened. Bright nickel finish (US15).

1. Hinge Quantity: Provide hinge quantity as recommended by hinge manufacturer based on cabinet door width, weight, thickness, door material, and hinge cup selection.

B. Cee Shaped Wire Pulls: Hafele, Zinc Handles, Catalog No. 116.22.647 or approved equal ; fabricated from 10 mm diameter matt nickel plated zinc bar or wire stock, 136 mm overall length with 128 mm center to center of bases, and 27 mm overall projection.

C. Drawer Slides: All drawer slides shall permit the drawer to which they are attached to be removed by the occupant.

1. Pencil Drawers: Similar to Accuride 2006 having 3/4 extension carburized steel ball bearing, side mounting, 45 lbs. capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, single movement action, positive stop, bright electro zinc plate finish.
2. Drawers less than 4" deep: Similar to Accuride 3832 having full extension carburized steel ball bearing, side mounting, 50 lb. capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
3. Drawers greater than 4" but less than 8" deep: Similar to Accuride 3832 having full extension carburized steel ball bearing, side mounting, 100 lb. capacity medium duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.
4. Drawers greater than 8" deep: Similar to Accuride 4032 having full extension carburized steel ball bearing, rail mounting, 150 lb. capacity heavy duty load rating, cold rolled steel slide members and ball retainers, cushioned in and outstops, detent-in, progressive action, positive stop, bright electro zinc plate finish.

D. Cabinet Locks: All cabinet doors and drawers shall be furnished with locks.

1. Drawers: Provide one of the following lock assemblies:

a. Cam lock similar to Hafele 235.12.261, chrome plated, with Offset Cam 219.13.9xx, sized to fit opening.
b. Cam lock similar to Hafele 235.12.221, chrome plated, with surface-mounted strike 251.60.703.

2. Single Doors: Provide one of the following lock assemblies:

a. Cam lock similar to Hafele 235.12.261, chrome plated, with Offset Cam 219.13.9xx, sized to fit opening.
b. Cam lock similar to Hafele 235.12.221, chrome plated, with surface-mounted strike 251.60.703.

3. Pairs of Doors: Provide the following:

a. At inactive leaf, Furniture bolt similar to Hafele 252.02.644, polished chrome, with strike 251.60.703.
b. At active leaf, provide Single Door lock assembly.

E. Silencers: Provide felt silencers on jamb and/or head and sill strike areas of all cabinet doors; 2 for paired doors, 3 for single doors.

F. Cabinet Shelving Supports: Nickel plated shelf support pegs in brass sockets (Hafele 282.01.701 x 282.50.704).

G. Wire Management Grommets: Where a wire management grommet is indicated, provide nominal 3" outside diameter US26D satin chrome finished brass grommet caps with one cord slot, provide with each cap a matching brass tube liner finished to match cap, grommet cap shall rest directly on desktop with an overall rise of 1/8" above desktop.

1. 2-1/4” diameter; MG Series; Doug Mockett.
2. 2-3/8” diameter; MM Series; Doug Mockett.

H. Wire Management: WM 11; Doug Mockett.

I. Stainless Steel Trim: Custom fabricate stainless steel trim shapes to the sizes, shapes and profiles shown from the following materials. Provide in standard commercial tempers and hardness, as required for fabrication, strength and durability from Type 304 alloy. Form exposed work true to line and level, with flush surfaces and accurate angles. Ease exposed edges to a radius of approximately 1/32" radius, unless otherwise shown. Miter exposed corner joints and machine fit to a hairline joint. All sheet goods shall be provided finished one side only. Finish designation shown on the drawings are NAAMM nomenclature.

1. Sheet and Plate: ASTM A666.
2. Bar Stock: ASTM A276.
3. Pipe: ASTM 312, Grade TP 304.
4. Tubing: ASTM A 554, Grade MT 304.

J. Stainless Steel Trim Finish: Provide the following mechanical finish to the exposed surfaces of the fabricated work to the extent indicated (NAAMM nomenclature), with texture and reflectivity as required to match the Architect's sample.

1. No. 4 (bright directional polish).

K. Steel Reinforcing: Carbon steel shapes, tubes and plates complying with ASTM A36 (shapes and plates), and ASTM A500 or A501 (for tubes).

1. Shop Primer for Concealed Steel Reinforcing: Provide fast curing, lead and chromate free, universal modified alkyd primer complying with performance requirements in FS TT-P-664.

2. Electrodes for Concealed Steel Reinforcing: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded.

L. Hanging (Zee Clip) Strips: Extruded aluminum zee type interlocking clips; type, size and quantity for the condition of use.

M. Adjustable Shelf Standards and Supports: Knape & Vogt No. 83 Standard with 183 Bracket. Furnish brackets sized for shelf depth indicated. Provide standards and brackets in white factory finish.

N. Adjustable Leveling Glides **:** Zinc plated steel stud and black polypropylene base. Stud shall tilt several degrees under load to compensate for unlevel surfaces. Provide leveling guides at base of all millwork, in sufficient quantity to distribute load.

O. Bag Scales (Item E41): Airport baggage scales shall be furnished where indicated. Scales shall be NTEP approved, comply with NBS HB-44, have a 300 pound x 0.5 lb. capacity, a platform size of 2'-8" x 2'-6" unless otherwise indicated, a baggage weight accumulate feature, an overweight alert feature containing an LED readout that flashes to indicate baggage exceeds weight limit, a 16 ga. type 304 stainless steel platform, brush stainless steel faceplates, an RS-232 computer connection. Base configuration to be Standard Base, recessed mount.

1. Manufacturer and Product: Triner, Accurate Scales; Airport Baggage Scale 600LP.

2.4 FABRICATION, GENERAL

A. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

B. Fabricate woodwork to dimensions, profiles, and details indicated.

1. Reinforcing shown is minimum. Provide additional steel and lumber reinforcing as required to sustain imposed loads and to ensure a rigid assembly.
2. Exposed surfaces shall be free from dents, tool marks, warpage, buckle, glue and open joints, or other defects affecting serviceability or appearance. Accurately fit all joints, corners and miters. Conceal all fasteners. Make threaded connections up tight so that threads are entirely concealed. No exposed shims shall be visible from any viewing angle on finished woodwork.

C. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for

shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

1. The width of scribe and filler panels shall not exceed ½", or ½" clear dimension from adjacent wall to outside face of cabinet door in a 90 degree position, which ever is greater.

D. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a water-resistant coating.

2.5 PLASTIC-LAMINATE CABINETS

A. Quality Standard: Comply with AWI Section 400 requirements for laminate cabinets.

B. Grade: Custom.

C. AWI Type of Cabinet Construction: Flush overlay.

D. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: HGS.
2. Vertical Surfaces: VGS.
3. Edges: Matching surfaces adjacent to edges.

E. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: VGS.
2. Drawer Sides and Backs: VGS.
3. Drawer Bottoms: VGS.

F. Colors, Patterns, and Finishes: As shown and scheduled on the drawings.

G. Provide dust panels of 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.6 PLASTIC-LAMINATE COUNTERTOPS

A. Quality Standard: Comply with AWI Section 400 requirements for high-pressure decorative laminate countertops.

B. Grade: Custom.

C. High-Pressure Decorative Laminate Grade: HGS.

D. Colors, Patterns, and Finishes: As shown and scheduled on the drawings.

E. Edge Treatment: Same as laminate cladding on finished sides. Provide 3mm T-mold straight PVC edging at all countertop front edges adhesively bonded to countertop.

F. Core Material: Particleboard or medium-density fiberboard.

G. Core Material at Sinks: Particleboard made with exterior glue, medium-density fiberboard made with exterior glue.

2.7 SOLID-SURFACING-MATERIAL COUNTERTOPS

A. Quality Standard: Comply with applicable provisions of AWI Section 400 requirements for countertops.

B. Grade: Custom.

C. Colors, Patterns, and Finishes: As shown and scheduled on the drawings as ‘Speciality Finish’.

D. Factory fabricate components to achieve required shapes, sizes, and profiles shown, without cracks, spalling, pits, surface porosity, chipped areas, or blisters.

1. Form all countertops to 3/4" minimum thickness in one piece lengths. Provide adhesively-bonded 1/2" thick 4" high backsplashes and aprons unless otherwise indicated. Form edges to profiles shown. If required, use 2 sheets of countertop sheet material laminated together using manufacturer's standard adhesive to form edges. Laminated sections shall be in close contact throughout. Adhesive stains will not be permitted.

2. Provide separate 4" high end splashes, unless otherwise indicated.

3. Countertops shall be factory cored for plumbing fittings provided under Division 23 MECHANICAL.

E. Radius corners and edges.

F. Finish exposed surfaces by trimming and grinding smooth.

2.8 FASTENERS, ANCHORS, AND MISCELLANEOUS MATERIALS

A. Screws: Select material, type, size, and finish required for each use. Comply with FS FF-S-111 for applicable requirements.

B. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

C. Anchors: Select material, type, size, and finish required by each substrate for secure anchorage. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

D. Blind Splines: Specialty devices, as required for tight butt joining, types and size as recommended by woodwork fabricator.

E. Covercaps: Where mortises of fastener heads, or draw downs are exposed (blind holes) in finished work, provide black plastic covercaps.

2.9 SHOP FINISHING

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

B. Production finish architectural woodwork at fabrication shop. Defer only final touchup, cleaning, and polishing until after installation.

C. Priming of interior architectural woodwork with field applied opaque finish required to be performed at fabrication shop are specified in this Section. Refer to Section 09912 "Painting" for finishing opaque finished architectural woodwork.

D. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of woodwork. Apply two coats to back of paneling and to end-grain surfaces. Concealed surfaces of plastic-laminate-clad woodwork do not require backpriming when surfaced with plastic laminate, backing paper, or thermoset decorative overlay.
2. Gluing of face veneers shall, where possible, be by the hot plate method; glued surfaces shall be in close contact throughout. Glue stains will not be permitted.

E. Exposed Surfaces:

1. Opaque Finish:

a. Grade: Custom.
b. Color: Match Architect’s paint samples.

2. Plastic Laminate Finish: Gluing of plastic laminate surfacing materials shall be by the hot plate method, glued surfaces shall be in close contact throughout. Glue stains shall not be permitted.

3. Solid Surfacing Finish: As scheduled.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installation.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including backpriming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

1. Install woodwork plumb, level, true, and straight with no distortions, and with no variations in flushness of adjoining surfaces. Shim as required with concealed shims.
2. Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.

B. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to blocking with countersunk, concealed fasteners and blind nailing as required for complete installation.

C. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 96 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base, if finished.

D. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

1. Install cabinets without sag, bow, or other variation from a straight line.
2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head sheet metal screws through metal backing or metal framing behind wall finish.

E. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

2. Secure backsplashes to tops with concealed metal brackets at 16 inches o.c. and to walls with adhesive.

3. Calk space between backsplash and wall with silicone sanitary sealant specified in Section 07 92 00 JOINT SEALANTS.

F. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips and by blind nailing on backup strips, splined-connection strips, and similar associated trim and framing. Do not face nail unless otherwise indicated. Space panels so that reveals are parallel and of widths shown.

G. Complete the finishing work specified in this Section to extent not completed at shop or before installation of woodwork.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer, that ensures that woodwork will be without damage or deterioration at time of Substantial Completion.

END OF SECTION 06 40 23

SECTION 06 61 16 - SOLID SURFACING FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies solid polymer fabrications for the toilet and bath room countertops and vanity tops.

1.2 SUBMITTALS

A. Manufacturer's Data: Submit copies of manufacturer's specifications and installation instructions for solid polymer fabrications.

B. Samples: Submit three 6" x 6" samples of solid polymer fabrication material in each color specified. Sample acceptance will be for color, appearance and texture only.

C. Shop Drawings: Submit shop drawings indicating dimensions, component sizes, fabrication details, attachment provisions and coordination requirements with adjacent work, include rough-in dimensions for mechanical trades.

D. Maintenance Data: Submit manufacturers care and maintenance data, including repair and cleaning instructions.

1.3 PRODUCT HANDLING

A. Protect solid polymer fabrications against damage during transportation, storage, during installation and until completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Solid Polymer Fabrication Resin Material

1. Product and Manufacturer: Formica Corporation per finish schedule

B. Bonding Adhesives: Two part adhesive with color matching solid polymer fabrication and of type as recommended by solid polymer fabrication manufacturer for joining aprons, end and backsplashes to tops.

2.2 FABRICATION

A. Factory fabricate components to achieve required shapes, sizes, and profiles shown, without cracks, spalling, pits, surface porosity, chipped areas, or blisters.

1. Form all toilet and bath room and vanity countertops to 1/2" minimum thickness in one piece lengths. Provide molded bowls, formed from same material as countertop but from

color(s) indicated, adhesively-bonded to countertops where indicated. Provide integral or adhesively-bonded 1/2" thick backsplashes and aprons where indicated. Form edges to profiles shown. If required, use 2 sheets of countertop sheet material laminated together using manufacturer's standard adhesive to form edges. Laminated sections shall be in close contact throughout. Adhesive stains will not be permitted.

a. Bowls shall be formed to include provisions for drainage and overflow.

2. Provide separate end splashes of height to match backsplashes unless otherwise indicated.

3. Countertops shall be factory cored for plumbing fittings and toilet accessories provided under Section 10 28 13 ‘Toilet Accessories’ and Division 23 MECHANICAL.

B. Radius corners and edges.

C. Finish exposed surfaces with sandpaper followed by abrasive pad for final surfacing in accordance with solid polymer manufacturers written instructions.

2.3 MISCELLANEOUS MATERIALS

A. Sealants: Sanitary Silicone Sealant in one color as selected by Architect from manufacturers standards. Refer to Section 07 92 00 ‘Joint Sealants’.

B. Steel Framing for Countertops: Refer to Section 05 50 00 ‘Metal Fabrications’.

C. Plywood for Countertops: Refer to Section 06 10 53 ‘Miscellaneous Rough Carpentry’.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify all measurements in the field. Coordinate the work of other trades with the Work of this Section.

3.2 INSTALLATION

A. Provide a competent and experienced superintendent to supervise, coordinate and expedite the Work continuously.

B. Uncrate solid polymer fabrications and attach to substrates where indicated. Install components plumb, true and level, scribed to adjacent finishes in accordance with the accepted shop drawings and product installation data.

C. Form field joints, if any, using manufacturers recommended adhesive, with joints inconspicuous in finished work. Keep components and hands clean when making joints. Remove adhesives, sealants, and other stains. Remove and replace stained units which cannot be cleaned.

D. Make plumbing connections to toilet room countertops and vanities in accordance with Division 22 work.

E. Prepare joints and place sealants as indicated and specified in Section 07 92 00 'Joint Sealants'.

3.3 CLEANING

A. At a time as directed by the Architect, remove all temporary protection and leave the installation clean and free of any imperfections.

END OF SECTION 06 61 16

SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glass-fiber reinforced plastic (FRP) wall paneling and trim accessories.

B. Related Sections:

1. Division 06 Section "Rough Carpentry" for wood furring for installing plastic paneling.
2. Division 10 Section "Wall and Door Protection" for corner guards installed over plastic paneling.

1.3 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content and chemical components.
2. Product Data for Credit EQ 4.4: For laminating adhesive used in factory-laminated plastic panels, indicating that product contains no urea formaldehyde.

C. Samples for Initial Selection: For plastic paneling and trim accessories.

D. Samples for Verification: For plastic paneling and trim accessories, in manufacturer's standard sizes.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain plastic paneling and trim accessories from single manufacturer.

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

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.
3. Testing Agency: UL.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install plastic paneling until spaces are enclosed and weathertight 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 PLASTIC SHEET PANELING

A. General: Gelcoat-finished, glass-fiber reinforced plastic panels complying with ASTM D 5319.
1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Finish Schedule.

2.2 ACCESSORIES

A. Trim Accessories: Manufacturer's standard one-piece vinyl extrusions designed to retain and cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: As selected by Architect from manufacturer's full range.

B. Trim Accessories: Manufacturer's standard two-piece, snap-on vinyl extrusions designed to cover edges of panels. Provide division bars, inside corners, outside corners, and caps as needed to conceal edges.

1. Color: As selected by Architect from manufacturer's full range.

C. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.

D. Concealed Mounting Splines: Continuous, H-shaped aluminum extrusions designed to fit into grooves routed in edges of factory-laminated panels and to be fastened to substrate.

E. Adhesive: As recommended by plastic paneling manufacturer.

1. VOC Content: 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Sealant: Single-component, mildew-resistant, neutral-curing silicone sealant recommended by plastic paneling manufacturer and complying with requirements in Division 07 Section "Joint Sealants."

1. VOC Content: 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 substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Remove wallpaper, vinyl wall covering, loose or soluble paint, and other materials that might interfere with adhesive bond.

B. Prepare substrate by sanding high spots and filling low spots as needed to provide flat, even surface for panel installation.

C. Clean substrates of substances that could impair bond of adhesive, including oil, grease, dirt, and dust.

D. Condition panels by unpacking and placing in installation space before installation according to manufacturer's written recommendations.

E. Lay out paneling before installing. Locate panel joints to provide equal panels at ends of walls not less than half the width of full panels.

1. Mark plumb lines on substrate at panel joint locations for accurate installation.
2. Locate panel joints to allow clearance at panel edges according to manufacturer's written instructions.

3.3 INSTALLATION

A. Install plastic paneling according to manufacturer's written instructions.

B. Install panels in a full spread of adhesive.

C. Install panels with fasteners. Layout fastener locations and mark on face of panels so that fasteners are accurately aligned.

1. Drill oversized fastener holes in panels and center fasteners in holes.
2. Apply sealant to fastener holes before installing fasteners.

D. Install factory-laminated panels using concealed mounting splines in panel joints.

E. Install trim accessories with adhesive.

F. Fill grooves in trim accessories with sealant before installing panels and bed inside corner trim in a bead of sealant.

G. Maintain uniform space between panels and wall fixtures. Fill space with sealant.

H. Maintain uniform space between adjacent panels and between panels and floors, ceilings, and fixtures. Fill space with sealant.

I. Remove excess sealant and smears as paneling is installed. Clean with solvent recommended by sealant manufacturer and then wipe with clean dry cloths until no residue remains.

END OF SECTION 06 64 00

SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Modified bituminous sheet waterproofing.

1.2 SUBMITTALS

A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.

D. Special warranties.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A firm that is approved or licensed by waterproofing manufacturer for installation of waterproofing required for this Project.

B. Preinstallation Conference: Conduct conference at Project site.

1. Review waterproofing requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1.5 WARRANTY

A. Special Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to replace waterproofing material that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

A. Modified Bituminous Sheet: Not less than 60-mil- (1.5-mm-) thick, self-adhering sheet consisting of 56 mils (1.4 mm) of rubberized asphalt laminated to a 4-mil- (0.10-mm-) thick, polyethylene film with release liner on adhesive side and formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. American Hydrotech, Inc.; VM 75.
b. American Permaquik Inc.; PQ 7100.
c. Carlisle Coatings & Waterproofing Inc.; CCW MiraDRI 860/861.
d. CETCO Building Materials Group; Envirosheet.
e. Grace, W. R. & Co.; Bituthene 3000.
f. Henry Company; Blueskin WP 200.
g. Meadows, W. R., Inc.; SealTight Mel-Rol.

3. Physical Properties:

a. Tensile Strength: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
f. Hydrostatic-Head Resistance: 150 feet (45 m) minimum; ASTM D 5385.
g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
h. Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m); ASTM E 96, Water Method.

2.2 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Liquid waterborne primer recommended for substrate by manufacturer of sheet waterproofing material.

C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by manufacturer of sheet waterproofing material.

D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.

E. Substrate Patching Membrane: Low-viscosity, two-component, asphalt-modified coating.

F. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.

G. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Molded-Sheet Drainage Panel: Refer to Division 33 Section "Subdrainage."

2.4 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.

E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258.

F. Bridge and cover isolation joints expansion joints and discontinuous deck-to-wall and deck-to-deck joints with overlapping sheet strips.

1. Invert and loosely lay first sheet strip over center of joint. Firmly adhere second sheet strip to first and overlap to substrate.

G. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.

H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

2.5 APPLICATION

A. Install modified bituminous sheets according to waterproofing manufacturer's written instructions and according to recommendations in ASTM D 6135.

B. Apply primer to substrates at required rate and allow to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.

C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.

D. Horizontal Application: Apply sheets from low point to high point of decks to ensure that side laps shed water.

E. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.

F. Seal exposed edges of sheets at terminations not concealed by metal counterflashings or ending in reglets with mastic.

G. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.

I. Install protection course with butted joints over waterproofing membrane immediately.

J. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

2.6 PROTECTION AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 13 26

SECTION 07 14 16 – COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes cold fluid-applied polyurethane waterproofing applied to full height of all vertical concrete foundation wall surfaces at entire building perimeter (new construction only).

1.2 SUBMITTALS

A. Product Data: Submit product data including manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.

B. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

D. Qualification Data: For Installer.

E. Product test reports.

F. Warranty: Special warranty specified in this Section.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer, approved by manufacturer to install manufacturer's products.

B. Preinstallation Conference: Conduct conference at Project site.

1.4 STORAGE

A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.

B. Remove and replace liquid materials that cannot be applied within their stated shelf life. Protect stored materials from direct sunlight.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form, signed by manufacturer and Installer, and agreeing to repair or replace waterproofing that does not comply with requirements or that does not remain watertight for a period of 5 years after date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Basis of Design Product: 88R Aquablock by Karnak or approved equal

2.2 WATERPROOFING MATERIALS

A. Cold Fluid-Applied Waterproofing: Comply with ASTM C 836.

B. Primer: Manufacturer's standard, factory-formulated polyurethane or epoxy primer.

C. Sheet Flashing: 50-mil- (1.3-mm-) minimum, nonstaining uncured sheet neoprene.

1. Adhesive: Manufacturer's recommended contact adhesive.

D. Reinforcing Strip: Manufacturer's recommended fiberglass mesh or polyester fabric.

PART 3 - EXECUTION

3.1 SURFACE PREPARATION

A. Clean and prepare substrate according to manufacturer's written recommendations. Provide clean, dust-free, and dry substrate for waterproofing application.

1. Verify that substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.

D. Remove fins, ridges, and other projections and fill honeycomb, aggregate pockets, and other voids.

E. Prepare vertical and horizontal surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, and sleeves according to ASTM C 898 and manufacturer's written instructions.

1. Apply a double thickness of waterproofing and embed a joint reinforcing strip in preparation coat when recommended by waterproofing manufacturer.

F. Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 898 and waterproofing manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

G. Install sheet flashing and bond to deck and wall substrates where indicated or required according to waterproofing manufacturer's written instructions.

1. Extend sheet flashings onto perpendicular surfaces and other work penetrating substrate according to ASTM C 898.

3.2 WATERPROOFING APPLICATION

A. Apply waterproofing according to ASTM C 898 and manufacturer's written instructions.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases, with an average dry film thickness of 90 mils (2 mm) at any point.

B. Install protection course with butted joints over nominally cured membrane before starting subsequent construction operations.

3.3 CURING, PROTECTING, AND CLEANING

A. Cure waterproofing according to manufacturer's written recommendations, taking care to prevent contamination and damage during application stages and curing.

1. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 14 16
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SECTION 07 16 19 - METAL OXIDE WATERPROOFING

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 metal-oxide waterproofing for positive-side application to concrete.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for waterstops, and finishing concrete walls and slabs to receive waterproofing.
2. Division 07 Section "Joint Sealants" for elastomeric and preformed sealants in concrete and masonry walls and floors.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions and installation instructions for metal-oxide waterproofing.

B. Qualification Data: For Applicator.

C. Product Certificates: For waterproofing, patching, and plugging materials, from manufacturer.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for metal-oxide waterproofing.

E. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm experienced in applying metal-oxide waterproofing similar in material, design, and extent to that indicated for this Project, whose work has resulted in applications with a record of successful in-service performance, and that employs workers trained and approved by manufacturer.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 PROJECT CONDITIONS

A. Weather Limitations: Proceed with application only when existing and forecasted weather conditions permit metal-oxide waterproofing to be performed according to manufacturer's written instructions.

B. Proceed with waterproofing work only after pipe sleeves, vents, curbs, inserts, drains, and other projections through the substrate to be waterproofed have been completed. Proceed only after substrate defects, including honeycombs, voids, and cracks, have been repaired to provide a sound substrate free of forming materials, including reveal inserts.

C. Ambient Conditions: Proceed with waterproofing work only if temperature is maintained at 40 deg F (4.4 deg C) or above during work and cure period, and space is well ventilated and kept free of water.

PART 2 - PRODUCTS

2.1 WATERPROOFING MATERIALS

A. Metal-Oxide Waterproofing Compound: A product specifically formulated for waterproofing concrete and masonry substrates; containing pulverized iron and a chemical oxidizing agent to cause the iron particles to rust and grow in size in the presence of water; with VOC content complying with limits of authorities having jurisdiction.

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. Anti-Hydro International, Inc.; A-H Metallic Waterproofing.
b. Euclid Chemical Company (The); Iron Waterpeller.
c. Metalcrete Industries; Metalcrete Waterproofing.
d. Specco Industries, Inc.; Speccrete Metallic Waterproofer.

2.2 ACCESSORY MATERIALS

A. Patching Compound: Factory-premixed cementitious repair mortar, crack filler, or sealant recommended by waterproofing manufacturer for filling and patching tie holes, honeycombs, reveals, and other imperfections; compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

B. Plugging Compound: Factory-premixed cementitious compound with hydrophobic properties and recommended by waterproofing manufacturer; resistant to water and moisture but vapor permeable for all standard applications (vertical, overhead, and horizontal surfaces not exposed to vehicular traffic); compatible with substrate and other materials indicated; and VOC content complying with limits of authorities having jurisdiction.

C. Portland Cement: ASTM C 150, Type I.

D. Sand: ASTM C 144.

E. Water: Potable.

2.3 MIXES

A. Metal-Oxide Coats: Add metal-oxide waterproofing compound to portland cement, sand, and water according to manufacturer's written instructions. Blend together with mechanical mixer or by hand to required consistency for each coat.

B. Protection Coat: Field mix protection coat consisting of portland cement and sand as recommended by same manufacturer as metal-oxide waterproofing according to manufacturer's written instructions for application over waterproofing. Measure, batch, and mix materials with potable water. Blend together with mechanical mixer to required consistency.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for suitable conditions where waterproofing is to be applied.

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

C. Notify Architect in writing of active leaks or defects that would affect system performance.

3.2 PREPARATION

A. Protect other work from damage caused by cleaning, preparation, and application of waterproofing. Provide temporary enclosure to confine spraying operation and to ensure adequate ambient temperatures and ventilation conditions for application.

B. Do not allow waterproofing, patching, and plugging materials to enter reveals or annular spaces intended for resilient sealants or gaskets, such as joint spaces between pipes and pipe sleeves.

C. Stop active water leaks with plugging compound according to waterproofing manufacturer's written instructions.

D. Repair damaged or unsatisfactory substrate with patching compound according to manufacturer's written instructions.

1. At holes and cracks in substrate, remove loosened chips and cut reveal with sides perpendicular to surface, not tapered, and approximately 1 inch (25.4 mm) deep. Fill reveal with patching compound flush with surface.

E. Surface Preparation: Comply with waterproofing manufacturer's written instructions to remove efflorescence, chalk, dust, dirt, mortar spatter, grease, oils, paint, curing compounds, and form-release agents to ensure that waterproofing bonds to surfaces.

1. Clean concrete surfaces according to ASTM D 4258.

    a. Scratch- and Float-Finished Concrete: Etch with 10 percent muriatic (hydrochloric) acid solution according to ASTM D 4260.
    b. Prepare smooth-formed and trowel-finished concrete by mechanical abrading or abrasive-blast cleaning according to ASTM D 4259.
2. Concrete Joints: Clean reveals according to waterproofing manufacturer's written instructions.

3.3 APPLICATION

A. General: Comply with waterproofing manufacturer's written instructions for application and curing.

1. Saturate surface for several hours prior to application with water and maintain damp condition until applying waterproofing. Remove standing water.
2. Apply waterproofing to surfaces indicated on Drawings.
3. Number of Metal-Oxide Coats: Three.
4. Application Method: Brush apply the waterproofing, vigorously working first coat onto the substrate and forcing the material into surface voids. Brush each subsequent coat into full contact with previous coat.
5. Dampen surface between coats.
6. Allow each coat to set for 24 hours between coats.
7. Protection Coat: Apply to a thickness of 1/4 inch (6 mm) for walls and 1 inch (25 mm) for floors.

B. Final Coat Finish: Smooth.

C. Curing: Moist-cure waterproofing for three days immediately after final coat has set, followed by air drying prior to being placed in service, unless otherwise recommended in writing by manufacturer.

D. Waterproofing Treatment Extensions: Extend waterproofing treatment as follows:

1. Onto columns integral with treated walls.
2. Onto interior nontreated walls intersecting exterior treated walls, for a distance of 24 inches (600 mm) for cast-in-place concrete.
3. Onto exterior walls and onto both exterior and interior columns, for a height of 12 inches (300 mm), where floors, but not walls, are treated.
4. Onto every substrate in areas indicated for treatment, including pipe trenches pipe chases pits sumps and similar offsets and features.

3.4 FIELD QUALITY CONTROL

A. Inspection: Engage manufacturer's representative to inspect completed application and provide a written report that application complies with manufacturer's written instructions.

END OF SECTION 07 16 19

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Foam-plastic board insulation.
2. Glass-fiber blanket insulation (Batt Insulation)
3. Spray polyurethane foam insulation.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for insulation installed in cavity walls and masonry cells.
2. Division 06 Section "Sheathing" for foam-plastic board sheathing over wood or steel framing.
3. Division 07 Section "Self-Adhering Sheet Waterproofing Cold Fluid-Applied Waterproofing" for insulated drainage panels installed with waterproofing.

1.3 SUBMITTALS

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

B. LEED Submittals:

1. Product Data for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating costs for each product having recycled content.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

D. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

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

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation (walls): ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

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. DiversiFoam Products.
b. Dow Chemical Company (The).
c. Owens Corning.
d. Pactiv Building Products.

2. Type IV, 25 psi (173 kPa)

B. Extruded-Polystyrene Board Insulation (under concrete slabs on grade): Extruded-polystyrene board insulation complying with ASTM C 578, square edged; of type, density, and compressive strength indicated below:

1. 100-psi minimum compressive strength.

a. Foamular 1000; Owens-Corning.

2.2 GLASS-FIBER BLANKET INSULATION (BATT INSULATION)

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. CertainTeed Corporation.

2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

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

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.3 SPRAY POLYURETHANE FOAM INSULATION

A. Open-Cell Polyurethane Foam Insulation: Spray-applied polyurethane foam using water as a blowing agent, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

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. BaySystems NorthAmerica, LLC.
b. Demilec (USA) LLC.
c. Gaco Western Inc.
d. Icynene Inc.
e. SWD Urethane Company.

2. Minimum density of 0.4 lb/cu. ft. (6.4 kg/cu. m), thermal resistivity of 3.4 deg F x h x sq. ft./Btu x in. at 75 deg F (24 K x m/W at 24 deg C).

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical footing and foundation wall surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) below exterior grade line.

B. On horizontal surfaces under slabs, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units. Install per drawings.

3.4 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Division 04 Section "Unit Masonry."

3.5 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

D. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
1. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.6 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.7 INSTALLATION OF CURTAIN-WALL INSULATION

A. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer

to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.

2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.8 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.9 PROTECTION

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

END OF SECTION 07 21 00

SECTION 07 42 13 - METAL WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes metal wall panels.

1.2 DEFINITIONS

A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories necessary for a complete weathertight system.

1.3 PERFORMANCE REQUIREMENTS

A. General: Provide metal wall panel assemblies that comply with performance requirements specified as determined by testing manufacturers' standard assemblies similar to those indicated for this Project, by a qualified testing and inspecting agency.

B. Structural Performance: Refer to Section 08 91 10.

C. Thermal Movements: Provide metal wall panel assemblies that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

1.4 SUBMITTALS

A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal wall panel and accessory.

B. Shop Drawings: Submit shop drawings showing fabrication and installation layouts of metal wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, sheathing, air retarders, and accessories; and special details. Distinguish between factory- and field-assembled work.

1. Accessories: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches (1:10):

a. Flashing and trim.

2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Coordination Drawings: Exterior elevations drawn to scale and coordinating penetrations and wall-mounted items. Show the following:

1. Wall panels and attachments.
2. Girts and Stud framing.
3. Wall-mounted items including doors, windows, louvers, and lighting fixtures.

D. Samples: Submit samples for each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Wall and Soffit Panels: 12 inches (300 mm) long by actual panel width. Include fasteners, closures, and other metal wall panel accessories.
2. Trim and Closures: 12 inches (300 mm) long. Include fasteners and other exposed accessories.
3. Accessories: 12-inch- (300-mm-) long Samples for each type of accessory.

E. Maintenance Data: Submit maintenance data for metal wall panels for the inclusion in the maintenance manuals.

F. Warranties: Submit special warranties specified in this Section.

G. LEED Submittals:
1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include a statement indicating costs for each product having recycled content.
3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
   a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

1. Installer's responsibilities include fabricating and installing metal wall panel assemblies and providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

3. Engineering Responsibility: Preparation of data for metal wall panels, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.

B. Source Limitations: Obtain each type of metal wall panel through one source from a single manufacturer.

C. Mockups: Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects and qualities of materials and execution.

1. Build mockup of typical corner wall panel, including soffit, as shown on Drawings; approximately 48 inches (1200 mm) square by full thickness, including insulation, supports, attachments, and accessories.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, metal wall panel Installer, metal wall panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal wall panels including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal wall panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
6. Review governing regulations and requirements for insurance, certificates, and testing and inspecting if applicable.
7. Review temporary protection requirements for metal wall panel assembly during and after installation.
8. Review wall panel observation and repair procedures after metal wall panel installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, metal wall panels, and other manufactured items so as not to be damaged or deformed. Package metal wall panels for protection during transportation and handling.

B. Unload, store, and erect metal wall panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal wall panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal wall panels to ensure dryness, with positive slope for

drainage of water. Do not store metal wall panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect strippable protective covering on metal wall panels from exposure to sunlight and high humidity, except to extent necessary for period of metal wall panel installation.

1.7 PROJECT CONDITIONS

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

B. Field Measurements: Verify locations of structural members and wall opening dimensions by field measurements before metal wall panel fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal wall panels without field measurements, or allow for field trimming of panels. Coordinate wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.8 COORDINATION

A. Coordinate metal wall panel assemblies with rain drainage work, flashing, trim, and construction of girts, studs, soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures, including rupturing, cracking, or puncturing.
b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS (M-3 and M-07)

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alclad alloy 3003, 3004, or 3105 for painted finishes, with temper as required to suit forming operations and structural performance required.

1. Alternative alloys include the following:

a. Alclad Alloy 3003: H14, H16, H24, or H26 temper.
b. Alclad Alloy 3004: H22, H24, H32, or H34 temper.
c. Alloy 3105: H14 or H16 temper.
d. Alloy 5005: H14, H16, H24, H26, H34, or H36 temper.

2. Surface: Smooth, flat finish.
3. Exposed Finishes: Apply the following coating, as specified or indicated on Drawings.

a. High-Performance Organic Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid-chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Fluoropolymer Two-Coat System: Manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605.

b. Colors:

1) Custom color: Refer to Finish Materials Schedule drawing

4. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), alloy and temper recommended by manufacturer for type of use and finish indicated.

C. Panel Sealants: All sealing materials exposed at metal wall panel perimeter joints in contact with adjacent cladding materials are specified in Division 7 Section “Joint Sealants”.

2.2 MISCELLANEOUS METAL FRAMING

A. General: Refer to Section 05 40 00, COLD FORMED METAL FRAMING.

2.3 MISCELLANEOUS MATERIALS

A. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads.

1. Fasteners for Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of metal wall panels.
2. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
3. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

B. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

C. Plywood Sheathing: Refer to Section 06 10 53, MISCELLANEOUS CARPENTRY.

D. Combination Water Barrier /Air Retarder: Refer to Section 07 13 26, SELF ADHERING SHEET WATERPROOFING. The extent of work is also indicated on the drawings as “Ice and Water Shield”.

2.4 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels, unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same metal as metal wall panels.
2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Flashing and Trim: Formed from0.040 inch thick aluminum at corrugated wall panels . Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal wall panels.

2.5 FABRICATION

A. General: Fabricate and finish metal wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA standards.
3. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
4. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended by metal wall panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal wall panel supports, and other conditions affecting performance of work.

1. Examine primary and secondary wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal wall panel manufacturer.
2. Examine solid wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal wall panel manufacturer.

B. Examine roughing-in for components and systems penetrating metal wall panels to verify actual locations of penetrations relative to seam locations of metal wall panels before metal wall panel installation.

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

3.2 PREPARATION

A. Install flashings and other sheet metal to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

B. Install fasciae and copings to comply with requirements specified in Division 7 Section "Sheet Metal Flashing and Trim."

C. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal wall panel manufacturer's written recommendations.

1. Soffit Framing: Wire-tie or clip furring channels to supports, as required to comply with requirements for assemblies indicated.

3.3 METAL WALL PANEL INSTALLATION, GENERAL

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts and subgirts, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cutting of metal wall panels by torch is not permitted.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction. Predrill panels.

4. Flash and seal metal wall panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until weather barrier and flashings that will be concealed by metal wall panels are installed.
5. Install screw fasteners in predrilled holes.
6. Locate and space fastenings in uniform vertical and horizontal alignment.
7. Install flashing and trim as metal wall panel work proceeds.
8. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated or, if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Fasteners: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal wall panel manufacturer.

1. Coat back side of aluminum wall panels with bituminous coating where wall panels will contact wood, ferrous metal, or cementitious construction.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal wall panel assemblies. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal wall panel manufacturer.

1. Seal metal wall panel end laps with double beads of tape or sealant, full width of panel. Seal side joints where recommended by metal wall panel manufacturer.

3.4 FIELD-ASSEMBLED METAL WALL PANEL INSTALLATION

A. Lap-Seam Metal Wall Panels: Fasten metal wall panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap corrugated sheets one full corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
2. Locate and space fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.
3. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.

B. Zee Clips: Provide Zee clips of size indicated or, if not indicated, as required to act as standoff from subgirts for thickness of insulation indicated. Attach to subgirts with fasteners.

C. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.7 CLEANING AND PROTECTION

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

END OF SECTION 07 42 13

SECTION 07 42 43 - COMPOSITE WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal-faced composite wall panels.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design metal-faced composite wall panel assembly, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Provide metal-faced composite wall panel assemblies capable of withstanding the effects of the following loads and stresses within limits and under conditions indicated, based on testing according to ASTM E 330:

1. Wind Loads: Determine loads based on the following minimum design wind pressures:

a. Uniform pressure of 30 lbf/sq. ft. (1436 Pa), acting inward or outward.

2. Deflection Limits: Metal-faced composite wall panel assemblies shall withstand wind loads with horizontal deflections no greater than 1/175 of the span at the perimeter and 1/60 of the span anywhere in the panel of the span.

1.3 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation layouts of metal-faced composite wall panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details. Distinguish among factory-, shop-, and field-assembled work.

C. Samples: For each type of exposed finish required.

D. Delegated-Design Submittal: For metal-faced composite wall panel assembly indicated to comply with performance requirements and design criteria, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

E. Coordination Drawings: Exterior elevations, drawn to scale, on which the following items are shown and coordinated with each other.

F. Product test reports.

G. Maintenance data.

H. Samples of special warranties.

1.4 QUALITY ASSURANCE

A. Fire-Resistance Ratings: Where indicated, provide metal-faced composite wall panels identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal-faced composite wall panel assemblies that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal-faced composite wall panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PANEL MATERIALS

A. Aluminum Sheet: Coil-coated sheet, ASTM B 209 (ASTM B 209M), alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.

1. Surface: Smooth, flat finish.
2. Exposed Coil-Coated Finishes:
   a. Custom color Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

3. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Panel Sealants: ASTM C 920.

2.2 MISCELLANEOUS METAL FRAMING

A. Miscellaneous Metal Framing, General: ASTM C 645, cold-formed metallic-coated steel sheet, ASTM A 653/A 653M, G40 (Z120) hot-dip galvanized or coating with equivalent corrosion resistance unless otherwise indicated.

B. Subgirts: Manufacturer's standard C- or Z-shaped sections 0.064-inch (1.63-mm) nominal thickness.

C. Zee Clips: 0.079-inch (2.01-mm) nominal thickness.

D. Base or Sill Angles: 0.079-inch (2.01-mm) nominal thickness.

E. Hat-Shaped, Rigid Furring Channels:

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: As indicated.

F. Cold-Rolled Furring Channels: Minimum 1/2-inch- (13-mm-) wide flange.

1. Nominal Thickness: As required to meet performance requirements.
2. Depth: 3/4 inch (19 mm).
3. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with nominal thickness of 0.040 inch (1.02 mm).
4. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.57-mm-) diameter wire, or double strand of 0.048-inch- (1.22-mm-) diameter wire.

2.3 MISCELLANEOUS MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M).

B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide exposed fasteners with heads matching color of metal-faced composite wall panels by means of plastic caps or factory-applied coating. Provide EPDM, PVC, or neoprene sealing washers.

2.4 METAL-FACED COMPOSITE WALL PANELS (M-01 and M-02)

A. General: Provide factory-formed and -assembled, metal-faced composite wall panels fabricated from two metal facings bonded, using no glues or adhesives, to solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment system components and accessories required for weathertight system.

1. Fire-Retardant Core: Noncombustible, with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

a. Flame-Spread Index: 25 or less.
b. Smoke-Developed Index: 450 or less.

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. Alcan Composites USA Inc.; Alucobond Plus.
b. Alcoa Inc.; Reynobond PE.
c. ALPOLIC, Division of Mitsubishi Chemical America, Inc.; ALPOLIC.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.236 inch (6 mm).
2. Core: Standard.
3. Exterior Finish: 4-coat fluoropolymer.

a. Color: custom color. Refer to Material Finishes Schedule drawing

C. Attachment System Components: Formed from material compatible with panel facing.

1. Include manufacturer's standard perimeter extrusions with integral weather stripping panel stiffeners panel clips and anchor channels.

2.5 ACCESSORIES

A. Wall Panel Accessories: Provide components required for a complete metal-faced composite wall panel assembly including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal-faced composite wall panels unless otherwise indicated.

B. Flashing and Trim: Formed from 0.018-inch- (0.46-mm-) minimum thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal-faced composite wall panels.

2.6 FABRICATION

A. General: Fabricate and finish metal-faced composite wall panels and accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal-faced composite wall panels in a manner that eliminates condensation on interior side of panel and with joints between panels designed to form weathertight seals.

C. Metal-Faced Composite Wall Panels: Factory form panels in a continuous process with no glues or adhesives between dissimilar materials. Trim and square edges of sheets with no displacement of face sheets or protrusion of core material.

1. Form panel lines, breaks, and angles to be sharp and true, with surfaces free from warp and buckle.
2. Fabricate panels with sharply cut edges, with no displacement of face sheets or protrusion of core material.
3. Fabricate panels with panel stiffeners, as required to comply with deflection limits, attached to back of panels with structural silicone sealant or bond tape.
4. Dimensional Tolerances:

    a. Panel Bow: 0.8 percent maximum of panel length or width.
    b. Squareness: 0.25 inch (5 mm) maximum.

D. Sheet Metal Accessories: Fabricate flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Miscellaneous Framing: Install subgirts, base angles, sills, furring, and other miscellaneous wall panel support members and anchorage according to ASTM C 754 and metal-faced composite wall panel manufacturer's written instructions.

3.2 METAL-FACED COMPOSITE WALL PANEL INSTALLATION

A. Attachment System Installation, General: Install attachment system required to support metal-faced composite wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
2. Do not begin installation until weather barrier and flashings that will be concealed by composite panels are installed.

B. Clip Installation: Attach panel clips to supports at each metal-faced composite wall panel joint at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Division 07 Section "Joint Sealants."

3.3 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal-faced composite wall panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal-faced composite wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), nonaccumulative, on level, plumb, and location lines as indicated and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal-faced composite wall panels are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of metal-faced composite wall panel installation, clean finished surfaces as recommended by panel manufacturer. Maintain in a clean condition during construction.

B. After metal-faced composite wall panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

END OF SECTION 07 42 43

SECTION 07 54 23 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Adhered TPO membrane roofing system.

1.2 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide roofing system with initial Solar Reflectance Index not less than 78 when calculated according to ASTM E 1980, based on testing identical products by a qualified testing agency.

B. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.

C. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.3 SUBMITTALS

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

B. LEED Submittals:
   1. Product Data for Credit SS 7.2: For roof materials, indicating that roof materials comply with Solar Reflectance Index requirement.
   2. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

D. Samples for Verification: For the following products:
   1. Sheet roofing, of color specified.

E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements.

F. Research/evaluation reports.

G. Field quality-control reports.

H. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product.

B. Source Limitations: Obtain components including roof insulation fasteners for membrane roofing system from same manufacturer as membrane roofing.

C. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

D. Preinstallation Roofing Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING- FULLY ADHERED

A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible TPO sheet.
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
      a. Carlisle SynTec Incorporated.
      b. Custom Seal Roofing.
      c. Firestone Building Products Company.
      d. GAF Materials Corporation.
      e. GenFlex Roofing Systems.
      f. Johns Manville.
      g. Mule-Hide Products Co., Inc.
      h. Stevens Roofing Systems; Division of JPS Elastomerics.
      i. Versico Incorporated.
   2. Thickness: 60 mils (1.5 mm), nominal.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
   1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   a. Plastic Foam Adhesives: 50 g/L.
   b. Gypsum Board and Panel Adhesives: 50 g/L.
   c. Multipurpose Construction Adhesives: 70 g/L.
   d. Fiberglass Adhesives: 80 g/L.
   e. Contact Adhesive: 80 g/L.
   f. Other Adhesives: 250 g/L.
   g. Single-Ply Roof Membrane Sealants: 450 g/L.
   h. Nonmembrane Roof Sealants: 300 g/L.
   i. Sealant Primers for Nonporous Substrates: 250 g/L.
   j. Sealant Primers for Porous Substrates: 775 g/L.

B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils (1.4 mm) thick, minimum, of same color as sheet membrane.

C. Bonding Adhesive: Manufacturer's standard, water based.

D. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening membrane to substrate, and acceptable to membrane roofing system manufacturer.

E. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

A. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class I, Grade 3, felt or glass-fiber mat facer on both major surfaces.

B. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) unless otherwise indicated.

C. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

B. Insulation Adhesive: Insulation manufacturer's recommended cold-applied adhesive formulated to attach roof insulation to substrate or to another insulation layer.

C. Cover Board: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/2 inch (13 mm) thick in locations indicated on drawings.

2.5 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 INSULATION INSTALLATION

A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

C. Install tapered insulation under area of roofing to conform to slopes indicated.

D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (68 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

E. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
1. Fasten insulation to resist uplift pressure at corners, perimeter, and field of roof.

3.2 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

C. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.

D. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

E. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

F. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

3.3 INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.4 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

B. Roof-Paver Walkways: Install walkway roof pavers according to manufacturer's written instructions in locations indicated, to form walkways. Leave 3 inches (75 mm) of space between adjacent roof pavers.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

END OF SECTION 07 54 23

SECTION 07 61 00 - SHEET METAL ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Standing-seam metal roofing, on-site, roll formed.

1.2 PERFORMANCE REQUIREMENTS

A. Energy Performance: Provide metal roofing with solar reflectance index not less than 78 when calculated according to ASTM E 1980 based on testing identical products by a qualified testing agency.

1.3 SUBMITTALS

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

B. LEED Submittals:

   1. Product Test Reports for Credit SS 7.2: For roof panels, indicating that panels comply with Solar Reflectance Index requirement (dependent upon architect's color selection)

C. Shop Drawings: Show installation layout of sheet metal roofing, including plans, elevations, expansion joint locations, and keyed details. Distinguish between shop- and field-assembled work.

   1. Include details for forming, joining, and securing sheet metal roofing, including pattern of seams, termination points, fixed points, expansion joints, roof penetrations, edge conditions, special conditions, connections to adjoining work, and details of accessory items.

D. Samples: For each exposed product and for each finish specified.

E. Coordination Drawings: Roof plans drawn to scale with coordinated details for penetrations and roof-mounted items.

F. Portable Roll-Forming Equipment Certificate: Issued by UL for equipment manufacturer's portable roll-forming equipment capable of producing panels that comply with UL requirements.

G. Product test reports.

H. Maintenance data.

I. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Roll-Formed Sheet Metal Roofing Fabricator Qualifications: Fabricator authorized by portable roll-forming equipment manufacturer to fabricate and install sheet metal roofing units required for this Project, and who maintains current UL certification of its portable roll-forming equipment.

B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for Class 90 wind-uplift resistance. Maintain UL certification of portable roll-forming equipment for duration of sheet metal roofing work.

C. Sheet Metal Roofing Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 WARRANTY

A. Special Warranty: Warranty form in which Installer agrees to repair or replace components of sheet metal roofing that fail in materials or workmanship within Two years from date of Substantial Completion.

B. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal roofing that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ROOFING SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.
   1. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40 (Class AZM150 coating designation, Grade 275); structural quality.
   2. Thickness: Nominal 0.028 inch (0.71 mm) unless otherwise indicated.
   3. Surface: Smooth, flat.
   4. Factory Prime Coating: Where painting after installation is indicated, pretreat with white or light-colored, factory-applied, baked-on epoxy primer coat; minimum dry film thickness of 0.2 mil (0.005 mm).
   5. Exposed Coil-Coated Finish:
      a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

6. Color: As selected by Architect from manufacturer's full range, including exotic and metallic colors.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils (0.76 to 1.0 mm) thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or SBS-modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F (116 deg C).
2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F (29 deg C).

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by primary sheet metal or portable roll-forming equipment manufacturer unless otherwise indicated.

B. Snap-On Seams: Provide snap-on seams integrated with panel-edge profile as recommended by portable roll-forming equipment manufacturer to produce sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article.

C. Fasteners: Wood screws, annular-threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.

1. General:

a. Exposed Fasteners: Heads matching color of sheet metal roofing using plastic caps or factory-applied coating.
b. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
c. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.

2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M, ASTM F 2329, or Series 300 stainless steel.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Copper Sheet: Copper, hardware bronze, or Series 300 stainless steel.
5. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

D. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
2. For Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.

3. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.

E. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.

F. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by portable roll-forming equipment manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal roofing and remain watertight.

G. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

H. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 ACCESSORIES

A. Sheet Metal Accessories: Provide components required for a complete sheet metal roofing assembly including trim, copings, fasciae, corner units, clips, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items. Match material and finish of sheet metal roofing unless otherwise indicated.

1. Provide accessories as recommended by portable roll-forming equipment manufacturer to produce sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article.
2. Cleats: For mechanically seaming into joints and formed from the following materials:

    a. Metallic-Coated Steel Roofing: 0.025-inch- (0.64-mm-) thick stainless steel.

3. Clips: Minimum 0.062-inch- (1.59-mm-) thick, stainless-steel panel clips designed to withstand negative-load requirements.
4. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin foam or closed-cell laminated polyethylene; minimum 1-inch- (25-mm-) thick, flexible-closure strips; cut or premolded to match sheet metal roofing profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
5. Flashing and Trim: Formed from same material and finish as sheet metal roofing, minimum thickness matching the sheet metal roofing.

B. Roof Curbs: Fabricated from same material and finish as sheet metal roofing, minimum thickness matching the sheet metal roofing; with bottom of skirt profiled to match roof panel profiles; with weatherproof top box and integral full-length cricket. Fabricate curb subframing of nominal 0.062-inch- (1.59-mm-) thick, angle-, C-, or Z-shaped galvanized steel or stainless-steel sheet. Fabricate curb and subframing to withstand indicated loads of size and height indicated. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

1. Insulate curbs with 1-inch- (25-mm-) thick, rigid insulation.
2. Install wood nailers at tops of curbs.

2.5 FABRICATION

A. General: Custom fabricate sheet metal roofing to comply with details shown and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to the design, dimensions (panel width and seam height), geometry, metal thickness, and other characteristics of installation indicated. Fabricate sheet metal roofing and accessories at the shop to greatest extent possible.
   1. Standing-Seam Roofing: Form standing-seam panels with finished seam height of 1 inch (25 mm).

B. General: Fabricate roll-formed sheet metal roofing panels with UL-certified, portable roll-forming equipment capable of producing roofing panels for sheet metal roofing assemblies that comply with UL 580 for wind-uplift resistance classification specified in "Quality Assurance" Article. Fabricate roll-formed sheet metal according to equipment manufacturer's written instructions and to comply with details shown.

C. Form exposed sheet metal work to fit substrates without excessive oil canning, buckling, and tool marks; true to line and levels indicated; and with exposed edges folded back to form hems.

   1. Form and fabricate sheets, seams, strips, cleats, valleys, ridges, edge treatments, integral flashings, and other components of metal roofing to profiles, patterns, and drainage arrangements shown on Drawings and as required for leakproof construction.

D. Metal Protection: Where dissimilar metals will contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by fabricator of sheet metal roofing or manufacturers of the metals in contact.

E. Sheet Metal Accessories: Custom fabricate flashings and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

A. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking and that tops of fasteners are flush with surface.

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free, on roof sheathing under sheet metal roofing. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures. Apply over entire roof, in shingle fashion to shed water, with end laps of not less than 6 inches (150 mm) staggered 24 inches (600 mm) between

courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.

B. Apply slip sheet before installing sheet metal roofing.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal roofing and other components of the Work securely in place, with provisions for thermal and structural movement. Install fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for a complete roofing system and as recommended by fabricator for sheet metal roofing.

1. Field cutting of sheet metal roofing by torch is not permitted.
2. Provide metal closures at peaks rake edges rake walls eaves and each side of ridge and hip caps.
3. Flash and seal sheet metal roofing with closure strips at eaves, rakes, and perimeter of all openings. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment. Predrill panels for fasteners.
5. Install ridge and hip caps as sheet metal roofing work proceeds.
6. Locate roofing splices over, but not attached to, structural supports. Stagger roofing splices and end laps to avoid a four-panel lap splice condition.
7. Install sealant tape where indicated.
8. Lap metal flashing over sheet metal roofing to allow moisture to run over and off the material.

B. Thermal Movement. Rigidly fasten metal roof panels to structure at only one location for each panel. Allow remainder of panel to move freely for thermal expansion and contraction.

1. Point of Fixity: Fasten each panel along a single line of fixing located at center of panel length locations indicated on Drawings
2. Avoid attaching accessories through roof panels in a manner that will inhibit thermal movement.

C. Fasteners: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

D. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering sheet underlayment to each contact surface, or by other permanent separation as recommended by SMACNA.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches (38 mm), except reduce pre-tinning where pre-tinned surface would show in completed Work.

1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

H. Rivets: Rivet joints in uncoated aluminum where indicated and where necessary for strength.

I. Standing-Seam Roofing: Attach standing-seam metal panels to substrate with cleats, double fastened at 12 inches (305 mm) o.c. Install panels reaching from eave to ridge before moving to adjacent panels. Before panels are interlocked, apply continuous bead of sealant to top of flange of lower panel. Lock standing seams by folding over twice so cleat and panel edges are completely engaged.

1. Lock each panel to panel below with sealed transverse seam.
2. Loose-lock panels at eave edges to continuous cleats and flanges at roof edge at gutters.
3. Fold over seams after locking at ridges and hips.

3.4 ON-SITE, ROLL-FORMED SHEET METAL ROOFING INSTALLATION

A. General: Install on-site, roll-formed sheet metal roofing fabricated from UL-certified equipment to comply with equipment manufacturer's written instructions for UL wind-uplift resistance class indicated. Provide sheet metal roofing of full length from eave to ridge unless otherwise restricted by on-site or shipping limitations.

B. Standing-Seam Sheet Metal Roofing: Fasten sheet metal roofing to supports with concealed clips at each standing-seam joint at location, at spacing, and with fasteners recommended by manufacturer of portable roll-forming equipment.

1. Install clips to substrate with self-tapping fasteners.
2. Install pressure plates at locations indicated in equipment manufacturer's written installation instructions.
3. Before panels are joined, apply continuous bead of sealant to top of flange of lower panel.
4. Snap-On Seam: Nest standing seams and fasten together by interlocking and completely engaging field-applied sealant.
5. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so cleat, sheet metal roofing, and field-applied sealant are completely engaged.

C. Seal joints as shown and as required for watertight construction. For roofing with 3:12 slopes or less, use cleats at transverse seams.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F (4 and 21 deg C), set joint members for 50 percent movement either way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F (4 deg C).

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

3.5 ACCESSORY INSTALLATION

A. General: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete sheet metal roofing assembly including trim, copings, seam covers, flashings, sealants, gaskets, fillers, metal closures, closure strips, and similar items.
2. Install accessories integral to sheet metal roofing that are specified in Division 07 Section "Sheet Metal Flashing and Trim" to comply with that Section's requirements.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

3.6 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean off excess and sealants.

C. Remove temporary protective coverings and strippable films as sheet metal roofing is installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 07 61 00

SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sheet metal flashing and trim:

1. Single Subcontract Responsibility: Refer to Section 07 54 23 TPO ROOFING for the requirements of single subcontract responsibilities for sheet metal flashing and trim in conjunction with the roofing and coping work.

1.2 PERFORMANCE REQUIREMENTS

A. General: Install sheet metal flashing and trim to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failing, rattling, leaking, and fastener disengagement.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft. (1.48 to 2.15 kPa): 90-lbf/sq. ft. (4.31-kPa) perimeter uplift force, 120-lbf/sq. ft. (5.74-kPa) corner uplift force, and 45-lbf/sq. ft. (2.15-kPa) outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allow for thermal movements resulting from surface temperatures ranging from -5^0F. to $+180^0$F., without buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of sheet metal and trim thermal movements.

1. Dimensions shown on Drawings are based on an assumed design temperature of $+70^o$F (+21 deg C). Fabrication and installation procedures shall take into account the ambient temperature range at the time of the respective operations.

D. Water Infiltration: Provide sheet metal flashing and trim that do not allow water infiltration to building interior.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show layouts of sheet metal flashing and trim, including plans and elevations. Distinguish between shop- and field-assembled work. Include the following:

1. Identify material, thickness, weight, and finish for each item and location in Project.

2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for fastening, joining, supporting, and anchoring sheet metal flashing and trim, including fasteners, clips, cleats, and attachments to adjoining work.
4. Details of expansion-joint covers, including showing direction of expansion and contraction.

C. Samples: Submit 8” x 8” (200 x 200 mm) square samples of sheet metal flashing, in the specified finish.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Subcontract the sheet metal flashing and trim work to a firm which is specialized in the fabrication and installation of sheet metal flashing and trim and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years.

B. Sheet Metal Flashing and Trim Reference Standards: Comply with the industry standard sources below. Where sheet metal flashing and trim work details have not been specifically detailed on the drawings or specified the Contractor shall submit, for the Architect’s approval, proposed sheet metal detailing. The primary source for proposed sheet metal detailing shall come from the industry standard sources below.

1. SMACNA's "Architectural Sheet Metal Manual."

2. NRCA’s “Roofing and Waterproofing Manual.”

C. Design Modifications: Submit design modifications necessary to meet the performance requirements and field coordination. Variations in details or materials which do not adversely affect the appearance, durability or strength of components shall be submitted to the Architect for review. Maintain the general design concept without altering size of members, profiles and alignment.

1.5 COORDINATION

A. Coordinate installation of sheet metal flashing and trim with interfacing and adjoining construction to provide a leakproof, secure, and noncorrosive installation.

1.6 WARRANTY

A. Furnish written warranty against water leakage resulting from defects of materials or workmanship. Upon notification of such defects, within the warranty period, make the necessary repairs and replacements at the convenience of, and no cost to, the Owner. This warranty shall be in addition to and not a limitation of other rights the Owner may have against the Contractor under the Contract Documents.

1. Warranty period shall be 5 years after the date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, soft annealed, Type 304, with No. 2D finish, except where harder temper is required for forming or performance.

2.2 UNDERLAYMENT MATERIALS

A. Self-Adhering, High-Temperature Sheet: 0.76 mm thick, self adhering, self sealing, underlayment consisting of slip-resisting high density cross laminated polyethylene-film top surface laminated to layer of butyl rubber based adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at 116 deg C; ASTM D 1970.
2. Product Reference: Grace, W. R. & Co.; Vycor Ultra.

2.3 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Fasteners: Wood screws, same metal as flashing/sheet metal, annular threaded nails, self-tapping screws, and other suitable fasteners designed to withstand design loads.

C. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer, use a noncorrosive rosin flux over tinned surfaces.

D. Sealing Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

E. Elastomeric Sealant: ASTM C 920, elastomeric polyurethane or silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant, polyisobutylene plasticized, heavy bodied for hooked-type expansion joints with limited movement.

G. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

I. Wood Nailer Strips: Provide wood nailer strips, fabricated to sizes indicated, from lumber complying with the requirements of Section 06105, MISCELLANEOUS CARPENTRY, and fire retardant treated by pressure process using chemical solution which is non-hygroscopic and non-corrosive to sheet metal used.

2.4 MANUFACTURED SHEET METAL FLASHING AND TRIM

A. Reglets: Units of type, material, and profile indicated, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated.

1. Material: Stainless steel, 0.0187 inch (0.5 mm) thick.

2. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.

3. Concrete Type: Provide temporary closure tape to keep reglet free of concrete materials, special fasteners for attaching reglet to concrete forms, and guides to ensure alignment of reglet section ends.

4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.

5. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.

2.5 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with the referenced standards that apply to design, dimensions, metal, and other characteristics of item indicated. Shop fabricate items where practicable. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.

C. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

D. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

E. Expansion Provisions: Where lapped or bayonet-type expansion provisions in the Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

F. Conceal fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

G. Fabricate cleats and attachment devices from same material as accessory being anchored. Cleats shall be 2 inches (50 mm) wide by nominal 3 inches (75 mm) long typically, minimum 0.0187 inch (0.5 mm) thick, punch for minimum 2 nail or screw holes. One end shall be locked into seams, or into folded edge of sheet metal sheets, the other end shall be secured with nails or screws and folded back over nail or screw heads.

2.6 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Gutters: Fabricate to cross section indicated, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required. Fabricate in minimum 96-inch- (2400-mm-) long sections. Fabricate expansion joints and accessories from same metal as gutters, unless otherwise indicated.

1. Fabricate gutters with built-in expansion joints and gutter-end expansion joints at walls.
2. Accessories: Wire ball downspout strainer.
3. Fabricate built-in gutters from the following material:

    a. Stainless Steel: 0.0156 inch (0.4 mm) thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Fabricate downspouts from the following material:

    a. Stainless Steel: 0.0156 inch (0.4 mm) thick.

C. Parapet Scuppers: Fabricate scuppers of dimensions required with closure flange trim to exterior, 4-inch- (100-mm-) wide wall flanges to interior, and base extending 4 inches (100 mm) beyond cant or tapered strip into field of roof.

1. Fabricate parapet scuppers from the following material:

    a. Stainless Steel: 0.0187 inch (0.5 mm) thick.

2.7 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch- (2400-mm-) long, but not exceeding 10-foot- (3-m-) long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, and solder watertight.

1. Joint Style: Butt, with 6-inch- (150-mm-) wide exposed cover plates.

2. Fabricate copings from the following material:

    a. Stainless Steel: 0.0250 inch (0.65 mm) thick.

B. Base Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

C. Counterflashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

D. Flashing Receivers: Fabricate from the following material:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

E. Roof-Penetration Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

2.8 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch- (2400-mm-) long, but not exceeding 12 foot (3.6 m) long, sections, under copings, at shelf angles, and where indicated. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches (150 mm) beyond each side of wall openings. Form with 2-inch- (50-mm-) high end dams. Fabricate through-wall flashing with drip edge, unless otherwise indicated. Fabricate by extending flashing 1/2 inch (13 mm) out from wall, with outer edge bent down 30 degrees. Fabricate from the following material:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

B. Openings Flashing in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high end dams. Fabricate from the following material:

1. Stainless Steel: 0.0156 inch (0.4 mm) thick.

2.9 MISCELLANEOUS SHEET METAL FABRICATIONS

A. Equipment Support Flashing: Fabricate from the following material:

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of work.

1. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim work.

B. Nailer and Underlayment Installation for Copings:

1. Provide wood nailers shown to properly install the coping. Form to shapes indicated and cut as required for true line and level of attached work. Set to required levels and lines. Allow approximately 1/8" between nailer ends and offset joints a minimum of 12" in multiple layers. Locate nailers to comply with requirements for attaching other construction.

2. Utilize mechanical fasteners that will have no detrimental effect on the components of the coping. Recess fasteners flush with surfaces. Fasten in accordance with FM 1-49 standards and the coping manufacturers recommendations.

3. Underlayment Installation: Install a course of self adhering high temperature sheet underlayment directly over nailers in accordance with the underlayment manufacturers instructions to the extent indicated on the drawings. Lap ends of underlayment lengths a minimum of 4”.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

1. Underlayment: Where installing metal flashing directly on cementitious or wood substrates at other than copings, install a course of felt underlayment and cover with a slip sheet.
2. Bed flanges in thick coat of asphalt roofing cement where required for waterproof performance.

D. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

E. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, and butyl sealant.

F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

1. Space cleats not more than 12 inches (300 mm) apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.

G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (600 mm) of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.

H. Fasteners: Use stainless steel fasteners of sizes that will penetrate substrate not less than 1-1/4 inches (32 mm) for nails and not less than 3/4 inch (19 mm) for wood screws.

I. Seal joints with butyl sealant as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant.

J. Soldered Joints: Edges of sheets to be soldered shall be in close contact at every point along the joint before soldering. Edges of all sheets of sheet metal to be soldered shall be tinned with solder on both sides for a minimum width of 1-1/2 inches (38 mm). Where specified, all seams shall be thoroughly soldered to produce watertight joints. All soldering shall be done slowly with well heated metal - to heat sheet thoroughly and to sweat solder completely through full width of seam. Ample solder shall be used and seam shall show at least one full inch of evenly flowed solder. Wherever possible all soldering shall be done in flat position. Remove every trace of flux residue from metal promptly after tinning. Comply with manufacturer's recommended methods for cleaning and neutralization. Clean exposed surfaces of sheet metal flashing and trim of every substance which is visible or might cause corrosion of metal surfaces. Use soldering irons (3 lb. Minimum each). Do not use abrasives in preparing the sheet metal surfaces for soldering. All exposed parts of finished soldered joints shall be smooth and free of smeared solder.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to the referenced standards and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Gutters: Join sections with riveted and soldered joints. Provide for thermal expansion. Slope to downspouts. Provide end closures and seal watertight with sealant.

1. Install self-adhering high temperature sheet underlayment layer in built-in gutter trough and under self adhering high temperature sheet underlayment on roof sheathing. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with roofing nails. Install slip sheet over self-adhering high temperature sheet underlayment.
2. Anchor and loosely lock back edge of gutter to continuous cleat.
3. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches (600 mm) apart.
4. Install gutter with expansion joints at locations indicated but not exceeding 50 feet (15.24 m) apart. Install expansion joint caps.

C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch (25 mm) away from walls; locate fasteners at top and bottom and at approximately 60 inches (1500 mm) o.c. in between.

1. Connect downspouts to underground drainage system indicated.

D. Parapet Scuppers: Install scuppers where indicated through parapet. Continuously support scupper, set to correct elevation, and seal flanges to interior wall face, over cants or tapered edge strips, and under roofing membrane.

1. Anchor scupper closure trim flange to exterior wall and seal or solder to scupper.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal roof flashing and trim to comply with performance requirements and the referenced standards. Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight.

B. Copings: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated.

1. Interlock exterior bottom edge of coping with continuous cleats anchored to substrate at 16-inch (400-mm) centers.
2. Anchor interior leg of coping with screw fasteners and washers at 20-inch (500-mm) centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches (100 mm) over base flashing. Install stainless-steel draw band and tighten.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches (100 mm) over base flashing. Lap seam counterflashing joints a minimum of 4 inches (100 mm).

1. Secure in a waterproof manner by means of anchor and washer at 36-inch (900-mm) centers.

2. Fill the reglet with elastomeric sealant.

3. Form a slight bend in the counterflashing to cause a spring action pressure of the lower edge of the sheet to be applied onto the base flashing.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Reglets: Installation of reglets is specified in Division 3 Section "Cast-in-Place Concrete."

C. Through-Wall Flashing: Installation of formed through-wall flashing is specified in Division 4 Section "Unit Masonry Assemblies."

D. Openings Flashing in Frame Construction: Fabricate head, sill, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch- (50-mm-) high end dams.

3.6 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Seal flashing with butyl sealant to equipment support member.

1. Stainless Steel: 0.0187 inch (0.5 mm) thick.

3.7 CLEANING AND PROTECTION

A. Clean and neutralize flux materials. Clean off excess solder and sealants.

B. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, and pieces of flashing. Maintain in a clean condition during construction.

C. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 07 62 00

SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes roof expansion accessories.

1. Single Subcontract Responsibility: Refer to Section 07 54 23 TPO ROOFING for the requirements of single subcontract responsibilities for roof expansion accessories.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide roof expansion assemblies that, when installed, remain watertight within movement limitations specified by manufacturer.

1.3 SUBMITTALS

A. Product Data: Submit product data including manufacturer's product specifications, construction details, material and finish descriptions, installation instructions, and dimensions of individual components.

B. Shop Drawings: Submit shop drawings including plans, elevations, sections, details, joints, splices, locations of joints and splices, anchorage details, intersections, transitions, fittings, and attachments to other Work. Where joint assemblies change planes, provide isometric drawings depicting how components interconnect to achieve continuity.

C. Warranties: Submit special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain metal-flanged, bellows-type roof expansion joint assemblies approved by roofing membrane manufacturer and that are part of roofing membrane warranty.

1.5 SCHEDULING

A. Coordinate delivery and installation of roof expansion assemblies to prevent damage and provide timely integration of units with roofing membranes and flashing.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer and Installer agree to repair or replace roof expansion assemblies that leak, deteriorate in excess of rates specified in

manufacturer's published product literature, or otherwise fail to perform within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Metal-Flanged, Bellows-Type Roof Expansion Joint Assemblies:

1. Where Indicated provide Expand-O-Flash products below each as manufactured by the Johns Manville Corporation.

a. FF-5 for 6” Joint.

b. Roof Area Divider into Gravel Stop 6” Joint.

c. Roof Area Divider into Gravel Stop 8” Joint.

d. Roof Area Divider into Gravel Stop 4” Joint.

2. Where indicated, provide Expansion Joint Systems as manufactured by the C/S Group TYPE BRJ for specific application recommended by manufacturer.

2.2 METALS

A. Stainless-Steel Sheet: Complying with ASTM A 666, Type 304

2.3 MISCELLANEOUS MATERIALS

A. Roof Cement: Complying with ASTM D 4586, Type II.

B. Caulk Sealant: Sealant; of type, grade, class, and use classifications required to seal joints in roof expansion accessories and to remain watertight.

C. Mineral-Fiber Blanket: Complying with ASTM C 665.

D. Flexible Cellular Sponge or Expanded Rubber: Manufacturer’s standard.

E. Fasteners: Manufacturer's recommended fasteners, fabricated from stainless steel, suitable for application and designed to withstand design loads.

1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads.

2.4 FIRE BARRIERS

A. Fire Barriers: Devices complying with requirements specified in Part 1 "Quality Assurance" Article for fire-test-response characteristics and designed for dynamic structural movement without material degradation or fatigue when tested according to ASTM E 1399. Provide roof expansion assemblies with manufacturer's continuous, standard, flexible fire-barrier seals in back of joint system at locations indicated to provide fire-resistance rating not less than rating of adjacent construction.

2.5 BELLOWS-TYPE ROOF EXPANSION ASSEMBLIES

A. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide manufacturer's standard assemblies of sizes and types indicated, with prefabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, coatings, and other components as recommended by roof expansion assembly manufacturer for complete installation. Fabricate assemblies specifically for roof-to-roof, roof-to-wall, curb-to-curb, and curb-to-wall applications to the extent indicated.

B. Metal-Flanged, Bellows-Type Roof Expansion Assemblies: Provide assemblies consisting of exposed polymeric sheet over foam bellows, securely anchored at both edges to 3- to 4-inch-(76- to 100-mm-) wide sheet metal nailing flanges, either flat or angle formed to fit wall, cant or curbs as required. Insulate bellows with closed-cell, flexible rubber or plastic foam not less than 5/16 inch (8 mm) thick; adhere bellows to underside of polymeric sheet.

1. Polymeric Sheet: Manufacturer's standard.
2. Metal Flanges: Stainless steel, minimum 0.015 inch (0.4 mm) thick.
3. Moisture Barrier: Manufacturer's standard, flexible, continuous, polymeric moisture barrier looped under roof expansion assembly covers at locations indicated. Fill space with blanket-type, glass-fiber insulation.
4. Fire Barrier: Provide manufacturer's standard fire barrier.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for handling and installing roof expansion assemblies and materials unless more stringent requirements are indicated.

B. Coordinate installation of roof expansion assembly materials and associated work so complete assemblies comply with assembly performance requirements.

C. Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of roof expansion assembly, including transitions and end joints.

D. Extend roof expansion assemblies over curbs, parapets, and other roof plane elements, with factory-fabricated intersections and transitions to provide continuous, uninterrupted, waterproof roof expansion assemblies. Install factory-fabricated transitions between roof expansion assemblies first.

1. Install mineral-fiber blanket insulation to fill joint space within joint and moisture barrier.

2. After flashing is installed on curbs, apply membrane compatible mastic to the top surface of the flashing indicated to receive the roof expansion joint assembly.

3. Set curb formed flange over curb, with foam side facing down into the joint, and fasten to each side of curb 6" o.c. starting 1" from end using 1-3/4"long grommeted screws.

4. For wall flanges, snap a horizontal line on the wall surface, parallel to the top of the curb, located at the top edge of the metal flange. Apply compatible mastic or roof cement to the back side of the wall flange. Fasten flange a maximum of 6" o.c. starting 1" from end using grommeted fasteners appropriate for the substrates being fastened into.

5. Install subsequent sections of expansion joints allowing a ½" space between each 10'-0" section.

    a. Provide uniform profile of expansion joint assembly throughout length of each installation; do not stretch polymeric sheets.

6. Splice roof expansion assemblies with materials provided by roof expansion assembly manufacturer for this purpose, according to manufacturer's written instructions, to provide continuous, uninterrupted, waterproof roof expansion assemblies.

    a. Prime metal and bellows 3" beyond both sides of each section joint to prepare for splice flashing material. Allow primer to cure in accordance with the expansion joint manufacturers written instructions.

    b. Caulk ¼" bead along seam where metal joins membrane, 3-1/2" each side of splice.

    c. Install 6" wide peel and stick splice tab, removing backer sheet ahead of application. Exend tab onto roof 4" beyond metal flange.

    d. Work tab well, especially at seam where metal joins membrane (over caulking bead) to avoid bridging.

    e. On roof flanges, install strip over flange using compatible membrane and adhesive with the roof system.

        1) On wall flange install counterflashing to cover top horizontal edge of the metal flange.

    f. On curb formed flanges end tab at bottom edge of flange.

3.2 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensures that roof expansion assemblies are without damage or deterioration at time of Substantial Completion.

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Roof hatches.
   2. Fall arrest equipment

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: For roof accessories.

C. Samples: For each exposed product and for each color and texture specified.

D. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items.

E. Operation and maintenance data.

F. Warranty: Sample of special warranty.

1.3 WARRANTY

A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finishes or replace roof accessories that show evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

B. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners.

C. Sealants: As recommended by roof accessory manufacturer for installation indicated.

2.3 FALL ARREST SYSTEM

A. Fall Arrest Roof Anchor: Basis-of-Design product is surface mount/single point roof anchor PDA by Diversified Fall Protection, LTD. Provide anchors as shown on drawings. System shall include permanent stainless steel cable horizontal lifeline at roof perimeter as shown on drawings. Assembly shall be certified as OSHA compliant.

2.4 ROOF HATCH

A. Roof Hatches: Industrial Sliding metal roof-hatch unit with lids and insulated single-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing, and integrally formed deck-mounting flange at perimeter bottom. Custom size per dimensions on drawings.

1 . Basis-of-Design Product: Subject to compliance with requirements, provide Industrial Roof Hatch manufactured by PS Corporation, 4212 Gateway Dr., Grand Forks, ND 58203. Phone Toll Free: 800-284-0623. Phone: 701-746-4519. Fax: 701-775-7415. Web Site: www.psdoors.com.

a. Basis-of-Design Product Details:

1. Hatch Panel: Hatch panel to be a nominal 5” thickness, with an internal welded steel structural framework. Framework voids to be insulated with fiberglass. Top and bottom face of panel to be sheeted with 18-gauge steel sheeting welded in place. Standard Panel designed for 30 lbs. live load. Panel shall have drip ledge on trail edge of panel and a minimum slope of 1:48 over the width of the hatch panel.

2. Extension Track Frame: To be factory-welded construction with factory located splice tabs for field attachment to curb frame. Adjustable height support legs extending to roof surface with minimum of 8” square roof pads.

3. Weatherhood to be an integral part of the hatch panel, to be fabricated from 12-gauge steel.

4. Hardware: Provide two (2) 12” x 3” bow handles mounted to the top surface of the hatch panel. Rollers to be minimum 6” diameter nylon, axles shall be minimum 1/2” diameter of high strength steel. All rollers to be non-corrosive and of spark-less design.

5. Perimeter Safety Railing to be a four (4) sided, removable railing to include 1.5” square 11-gauge steel tubing vertical posts, and horizontal railings of 1.74” outside diameter, 0.065” wall thickness mild steel, pre-galvanized before fabrication, tubing. Provide top rail and mid-rail sized and dimensioned to provide a safety railing system, which meets Federal OSHA requirements for Standard Railings at time of production.

6. Weatherseals: Weatherseals shall be nylon brush with a mill finish aluminum retainer at perimeter of opening.

7. Electric Operator: Provide one (1), NEMA 1 chain drive operator with weatherhood. Include one (1) surface mount, 3-button (Open-Close-Stop) Control Station.

8. Hatch Curb: To be sized and dimensioned to the requirements of the opening and hatch. Constructed of formed 16-gauge galvanealed steel. Curb to be insulated with rigid insulation.

9. Hatch Panel Sheeting: Panel to be sheeted with galvanealed steel sheeting or plate, Commercial Quality-Low Carbon ASTM-A-569, ASTM-A-366, ASTM-A-36 welded in place.

ROOF HATCH

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Verify dimensions of roof openings for roof accessories. Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.

C. Seal joints with sealant as required by roof accessory manufacturer.

3.2 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Division 09 painting Sections.

C. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 07 72 00

SECTION 07 81 00 - APPLIED FIREPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes low and medium density cementitious sprayed fire-resistive materials.

1.2 DEFINITIONS

A. Low density sprayed fire-resistive material is applied to surfaces that are concealed from view behind other construction when the Work is completed or that are exposed to view in locations where they will not be physically abused meaning that the materials are not in contact with end user or end user's equipment causing dislocation or reduction in required thickness of material.

B. Medium density sprayed fire-resistive material is applied to surfaces that are exposed to view in locations where;

1. they will be physically abused meaning that the materials are in contact with end user or end user's equipment causing dislocation or reduction in required thickness of material, and,
2. they will be physically exposed to high humidity and condensation.

1.3 SUBMITTALS

A. Product Data: Submit current edition of manufacturer's application and installation instruction manual and referenced bulletins.

B. Shop Drawings: Submit a "Fire-Resistive Materials Design Schedule Keyed to the Structural Drawings and Schedules" indicating the following:

1. Schedule for each building element receiving spray fire-resistive materials showing hourly rating and material thickness and UL Design Number.
2. When UL Designs are used for beams and columns smaller and larger than those listed in the UL Design, provide explanation of thickness adjustment based on W (weight per lineal foot)/D (perimeter of exposure) formulas for each element.
3. Locations and types of surface preparations required before applying sprayed fire-resistive material.
4. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including a schedule indicating the following:

    a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
    b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.
    c. Fire resistance design thicknesses for open web steel joists shall be based on testing at a maximum allowable stress of 30 ksi matching SJI’s “Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders”.

C. Test Reports: Submit reports of required testing.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" or from the listings of another testing and inspecting agency acceptable to authorities having jurisdiction, for sprayed fire-resistive material serving as direct-applied protection tested per ASTM E 119. Fire resistance design thicknesses for open web steel joists shall be based on testing at a maximum allowable stress of 30 ksi.
2. Surface-Burning Characteristics: ASTM E 84.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Contractor, installer and independent testing agency shall attend a pre-installation conference to review the substrates for acceptability, method of application, applied thicknesses, and testing and inspection procedures.

D. Regulatory Requirements: Conform to the applicable building code requirements of the authorities having jurisdiction. Products, execution, and the thickness spray fire resistive materials shall conform to the applicable code requirements for the required fire resistance ratings.

1. UL Degree of Restraint: Unrestrained.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, aboveground, in a dry location, until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply sprayed fire-resistive material when ambient or substrate temperatures are 40 deg F (4 deg C) or lower. When ambient or substrate temperatures are lower, provide temporary enclosures and heat to maintain temperatures at or

above this level for 24 hours before and during application, and after application for a minimum of 24 hours or more, until the sprayed fire resistive material is cured.

B. Ventilation: Ventilate spaces during and after application of sprayed fire-resistive material. Provide a minimum of 4 air changes per hour until fire resistive material cures by the following:

1. Using natural means.
2. When natural means are inadequate, provide forced-air circulation at a rate of 4 air exchanges per hour.

1.7 COORDINATION

A. Sequence and coordinate application of sprayed fire-resistive materials with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosures for interior applications to prevent deterioration of fire-resistive material due to exposure to unfavorable environmental conditions.
2. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
3. Do not apply fire-resistive material to metal roof deck substrates until concrete fill, if any, and roofing has been completed; prohibit roof traffic during application and drying of fire-resistive material.
4. Do not apply fire-resistive material to metal floor deck substrates until concrete fill has been completed.
5. Do not begin applying fire-resistive material until clips, hangers, supports, sleeves, and other items penetrating fire protection are in place.
6. Defer installing ducts, piping, and other items that would interfere with applying fire-resistive material until application of fire protection is completed.
7. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, tested and corrections have been made to defective applications.

1.8 WARRANTY

A. Special Warranty: Submit a written warranty, signed by Contractor and by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failures include, but are not limited to, cracking, flaking, or eroding by air or weather, in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship.
2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 LOW DENSITY SPRAYED FIRE-RESISTIVE MATERIALS

A. General: For low density applications of sprayed fire-resistive materials, provide manufacturer's standard products complying with requirements indicated for material composition and physical properties representative of installed products.

1. Extent: Except where indicated to receive medium density sprayed fire-resistive material, provide low density sprayed fire-resistive materials at steel decks and framing.

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

1. Cementitious Sprayed Fire-Resistive Material:

a. Carboline Co., Fireproofing Products Div.; Pyrolite 15 High Yield.
b. Grace, W. R. & Co.--Conn., Construction Products Div.; Monokote Type MK-6.
c. Isolatek International Corp., Cafco Products; Cafco 300.
d. AD Fire Protection Systems; Southwest Fireproofing 5GP.

C. Material Composition: Factory-mixed, dry formulation of gypsum or portland cement binders, additives, and lightweight mineral or synthetic aggregates mixed with water at Project site to form a slurry or mortar for conveyance and application.

D. Physical Properties: Minimum values, unless otherwise indicated, or higher values required to attain designated fire-resistance ratings, measured per standard test methods referenced with each property as follows:

1. Dry Density: 15 lb/cu. ft. (240 kg/cu. m) for average and individual densities regardless of density indicated in referenced fire-resistance design, or greater if required to attain fire-resistance ratings indicated, per ASTM E 605 or AWCI Technical Manual 12-A, (Third Ed.) Section 5.4.5, "Displacement Method."
2. Thickness: Provide minimum average thickness required for each fire-resistance design indicated according to ASTM E 605.
3. Bond Strength: 200 lbf/sq. ft. (9.5 kPa) minimum per ASTM E 736:
4. Air Erosion: Maximum weight loss of 0.001 g/sq. ft. (0.01 g/sq. m) in 24 hours per ASTM E 859. For laboratory tests, minimum thickness of sprayed fire-resistive material is 0.75 inch (19 mm), maximum dry density is 15 lb/cu. ft. (240 kg/cu. m), test specimens are not prepurged by mechanically induced air velocities, and tests are terminated after 24 hours.
5. Fire-Test-Response Characteristics: Provide sprayed fire-resistive materials with the following surface-burning characteristics as determined by testing identical products per ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

a. Flame-Spread Index: 10 or less.
b. Smoke-Developed Index: 0.

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with sprayed fire-resistive materials and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Adhesive for Bonding Fire-Resistive Material: Product approved by manufacturer of sprayed fire-resistive material.

C. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required to comply with fire-resistance designs indicated and fire-resistive material manufacturer's written recommendations. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive sprayed fire-resistive material.

D. Water: Potable. Provide water with sufficient pressure and volume to meet the fireproofing application schedule.

E. Sealer: Type recommended in writing by manufacturer of each sprayed fire-resistive material for application over exposed medium density sprayed fire-resistive material.

1. Grace, W. R. & Co.--Conn., Construction Products Div.; Firebond Clear Latex.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with installer and representative of the testing laboratory present, to determine that they are in satisfactory condition to receive sprayed fire-resistive material. Contractor, Installer and testing laboratory shall submit written statement of each area’s substrate acceptability to the Architect prior to beginning application of fire-resistive materials. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt, and other foreign substances capable of impairing bond of fire-resistive material with substrate under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates prior to application.
4. Substrates are not obstructed by ducts, piping, equipment, and other suspended construction that will interfere with applying fire-resistive material.

B. Prior to application of fireproofing to steel beams and decks verify that placement of concrete fill on floor and roof decks has been completed.

C. On roof decks without concrete fill complete all roofing applications and roof mounted equipment installation prior to application of fireproofing to the underside of supporting beams.

D. Do not proceed with installation of fire resistive materials until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances that could impair bond of fire-resistive material, including sprayed on building insulation (if any), dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and other foreign substances which may impair proper adhesion of fireproofing to substrate.

B. Metal Lathing: Where required by rated assembly and bond, install metal lath, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use. Securely attach lath to substrate in position required for support and reinforcement of fire-resistive material. Use anchorage devices of type recommended in writing by sprayed fire-resistive material manufacturer. Attach lathing accessories where indicated or required for secure attachment to substrate.

C. Cover other work subject to damage from fallout or overspray of fire-resistive materials before application. Provide temporary enclosure as required to confine spraying operations, protect the environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

1. Cover floor slabs with polyethylene sheeting.

3.3 INSTALLATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by sprayed fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

1. Medium density sprayed fire-resistive materials requiring a thickness of 1” or more will require a second course after the first course has set.

2. Knockdown surface of medium density sprayed fire-resistive materials with a trowel or paint roller immediately after application.

C. Apply 2 coats of sealer to medium density sprayed fire-resistive materials.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to verify the adequacy of the Contractor's quality control of the sprayed-fire resistive materials work.

1. The independent testing and inspection agency will promptly submit weekly test results to the Contractor and Architect in the form required under ASTM E605 and E736. The

reports shall clearly indicate the location of each test, the test result at that location, and whether or not the tested fire resistive materials at each test location complies with the Contract Documents.

B. Testing and Inspection: Testing and inspection of completed applications of sprayed fire-resistive material shall be conducted as the work progresses. Each thickness, density and bond strength test location shall be selected at random by the testing and inspection agency. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements.

C. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

D. Remove and replace, at Contractor's expense, including costs of delays to the work caused by removal and replacement, sprayed fire-resistive material where test results indicate that they do not comply with specified requirements for both cohesion and adhesion and for density.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each confinable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces.

B. Cure exposed cementitious-sprayed fire-resistive material according to product manufacturers written recommendations to prevent premature drying.

C. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

1. Trades, other than fireproofing installer, who remove fireproofing material will be responsible for replacement of same.

D. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas prior to covering by other construction.

END OF SECTION 07 81 00

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes through-penetration firestop systems for penetrations through the following fire-resistance-rated assemblies, including both empty openings and openings containing penetrating items:

1. Floors.
2. Roofs.
3. Walls and partitions.
4. Smoke barriers.
5. Construction enclosing compartmentalized areas.

1.2 PERFORMANCE REQUIREMENTS

A. General: For the following constructions, provide through-penetration firestop systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly penetrated.

1. Fire-resistance-rated load-bearing walls, including partitions, with fire-protection-rated openings.
2. Fire-resistance-rated non-load-bearing walls, including partitions, with fire-protection-rated openings.
3. Fire-resistance-rated floor assemblies.
4. Fire-resistance-rated roof assemblies.

B. F-Rated Systems: Provide through-penetration firestop systems with F-ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding fire-resistance rating of constructions penetrated.

C. T-Rated Systems: For the following conditions, provide through-penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per ASTM E 814, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:

1. Penetrations located outside wall cavities.
2. Penetrations located outside fire-resistive shaft enclosures.
3. Penetrations located in construction containing fire-protection-rated openings.
4. Penetrating items larger than 4-inch- (100-mm-) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

D. For through-penetration firestop systems exposed to view, traffic, moisture, and physical damage, provide products that after curing do not deteriorate when exposed to these conditions both during and after construction.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of through-penetration firestop system product indicated.

B. Through-Penetration Firestopping Schedule: Submit, for information only, a Through-Penetration Firestopping Schedule indicating the type of through-penetration firestop system to be installed for each penetration. Indicate each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of testing and inspecting agency acceptable to authorities having jurisdiction that evidences compliance with requirements for each condition indicated, and listed in the “Through Penetration Firestopping Schedule” at the end of Part 3 of this Section.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
2. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer.
3. At Project Closeout, submit a Record Schedule, signed by the Installer, of systems installed, the UL design designations, and the location of each system.

C. Product Certificates: Submit product certificates signed by manufacturers of through-penetration firestop system products certifying that products furnished comply with requirements.

D. Product Test Reports: Submit product test reports from a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified or licensed, by firestop system manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its firestop system materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain through-penetration firestop systems, for each kind of penetration and construction condition indicated, from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide through-penetration firestop systems that comply with the following requirements and those specified in "Performance Requirements" Article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
2. Through-penetration firestop systems are identical to those tested per ASTM E 814. Provide rated systems complying with the following requirements:
   a. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by the following:

      1) UL in "Fire Resistance Directory."
      2) ITS in "Directory of Listed Products."

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver through-penetration firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life, if applicable; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multicomponent materials.

B. Store and handle materials for through-penetration firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install through-penetration firestop systems when ambient or substrate temperatures are outside limits permitted by through-penetration firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate through-penetration firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.

C. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until Owner's inspecting agency and building inspector, if required by authorities having jurisdiction, have examined each installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide through-penetration firestop systems that are produced by manufacturers listed in UL-Classified Through Penetration Fire Stopping Assemblies in the Schedule at the end of Part 3 of this Section.

2.2 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with "Performance Requirements" Article. Use only components specified by through-penetration firestop system manufacturer and approved by the qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:

1. Permanent forming/damming/backing materials, including the following:

    a. Slag-/rock-wool-fiber insulation.
    b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
    c. Fire-rated form board.
    d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Gypsum Products: The use of gypsum products for through-penetration firestopping is strictly prohibited.

2.3 FILL MATERIALS

A. General: Provide through-penetration firestop systems containing the types of fill materials indicated in the Through-Penetration Firestop System Schedule at the end of Part 3 by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

B. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

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

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable, heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents and fire-retardant additives.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.

2.4 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance.

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

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing through-penetration firestop systems to comply with written recommendations of firestop system manufacturer and the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of through-penetration firestop systems.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with through-penetration firestop systems. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent through-penetration firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 THROUGH-PENETRATION FIRESTOP SYSTEM INSTALLATION

A. General: Install through-penetration firestop systems to comply with "Performance Requirements" Article and firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for firestop systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner may engage a qualified independent inspecting agency to inspect through-penetration firestop systems and to prepare test reports.

1. Inspecting agency will state in each report whether inspected through-penetration firestop systems comply with or deviate from requirements.

B. Proceed with enclosing through-penetration firestop systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace through-penetration firestop systems so they comply with requirements.

3.5 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning--Through-Penetration Firestop System--Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Through-penetration firestop system designation of applicable testing and inspecting agency.
4. Date of installation.
5. Through-penetration firestop system manufacturer's name.
6. Installer's name.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by through-penetration firestop system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure through-penetration firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated through-penetration firestop systems immediately and install new materials to produce through-penetration firestop systems complying with specified requirements.

3.7 THROUGH-PENETRATION FIRESTOP SYSTEM SCHEDULE

A. Select UL-classified systems from the attached schedule and submit "Through-Penetration Firestopping Schedule" as specified in Article 1.3 "Submittals."

THROUGH PENETRATION FIRE STOPPING SCHEDULE

THIS SCHEDULE INDICATES WHICH SERIES OF UL CLASSIFIED THROUGH PENETRATION FIRE STOPPING (TPFS) ASSEMBLIES ARE ACCEPTABLE FOR THIS PROJECT BASED ON BARRIER TYPE, BARRIER CONSTRUCTION AND PENETRANT TYPE.
EACH SYSTEM WITHIN A GIVEN SERIES IS CLASSIFIED FOR SPECIFIC PENETRATION CONDITIONS. CONTRACTOR SHALL SELECT TPFS ASSEMBLIES THAT ARE CLASSIFIED FOR USE WITH EACH PENETRATION'S CONDITION BASED ON CRITERIA SUCH AS THE FOLLOWING: PENETRATION SIZE, PENETRATION SHAPE, PENETRANT SIZE(S), PENETRANT MATERIAL(S), PENETRANT QUANTITY, LOCATIONS(S) OF PENETRANT(S) WITHIN PENETRATION.

BARRIER			PENETRANT TYPE											
TYPE	BASIS OF CONSTRUCTION	FIRE STOPPING REQUIREMENTS	NO PENETRANTS	METALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: COPPER, IRON, STEEL)	NONMETALLIC, UNINSULATED PIPE, CONDUIT, OR TUBING (EXAMPLES: PVC, CPVC, GLASS)	ELECTRICAL CABLES	CABLE TRAYS W/ELECTRICAL CABLES (NOTE 9)	INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) AND 122 DEGF (50 DEGC) (NOTE 1)	INSULATED PIPES (EXAMPLES: COPPER, GLASS, IRON, PLASTIC, STEEL) IN SYSTEMS OPERATING BETWEEN 32 DEGF (0 DEGC) OR ABOVE 122 DEGF (50 DEGC) (NOTE 2)	MISC ELECTRICAL PENETRATIONS (EXAMPLES: BUS DUCTS)	METAL DUCT	UL LISTED ELECTRICAL BOXES	OTHER RECESSED DEVICES (NOTE 3)
WALL	WOOD STUDS & GYPSUM WALLBRD	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
UL DESIGN NO. - U300 SERIES		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	W-L-8000 SERIES NOTE 5					W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	METAL STUDS & GYPSUM WALLBRD	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-L-0000 SERIES OR NOTE 4	W-L-1000 SERIES	W-L-2000 SERIES	W-L-3000 SERIES	W-L-4000 SERIES	W-L-5000 SERIES	W-L-5000 SERIES	W-L-6000 SERIES	W-L-7000 SERIES	CLIV OR NOTE 8	NOTE 8
UL DESIGN NO. - U400 SERIES		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	W-L-8000 SERIES NOTE 5					W-L-8000 SERIES NOTE 5	W-L-8000 SERIES NOTE 5	N/A	N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE
WALL	POURED CONC., CONC. BLOCK OR MASONRY	UL CLASSIFIED SYSTEM — SINGLE PENETRANT	W-J-0000 SERIES OR NOTE 4	C-AJ-1000 OR W-J-1000 SERIES	C-AJ-2000 OR W-J-2000 SERIES	C-AJ-3000 OR W-J-3000 SERIES	C-AJ-4000 OR W-J-4000 SERIES	C-AJ-5000 OR W-J-5000 SERIES	C-AJ-5000 OR W-J-5000 SERIES	C-AJ-6000 SERIES	C-AJ-7000 OR W-J-7000 SERIES	??	NOTE 8
UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES (ANY THICKNESS)		UL CLASSIFIED SYSTEM — MULTIPLE PENETRANTS	C-AJ-8000 OR W-J-8000 SERIES -- NOTE 5					C-AJ-8000 OR W-J-8000 SERIES - NOTE 5	C-AJ-8000 OR W-J-8000 SERIES - NOTE 5		N/A	N/A	
		F RATING	EQUAL TO BARRIER RATING										
		T RATING	EQUAL TO F RATING (NOTE 9)										
		ADDITIONAL REQUIREMENTS	NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE

WALL **POURED CONC. BLOCK OR MASONRY** UL DESIGN NO. FOR CONCRETE BLOCK WALL - U900 SERIES MINIMUM THICKNESS GREATER THAN EIGHT INCHES	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	NOTE 4	C-BK-1000 OR W-K-1000 SERIES	N/A	N/A	W-K-4000 SERIES	N/A	N/A	N/A	N/A	N/A		NOTE 8
		MULTIPLE PENETRANTS		N/A										
	F RATING		EQUAL TO BARRIER RATING											
	T RATING		EQUAL TO F RATING (NOTE 9)											
	ADDITIONAL REQUIREMENTS		NONE											
FLOOR **FRAMED**	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	NOTE 4	F-C-1000 SERIES	F-C-2000 SERIES	F-C-3000 SERIES	N/A	F-C-5000 SERIES	F-C-5000 SERIES	N/A	F-C-7000 SERIES	??		NOTE 8
		MULTIPLE PENETRANTS		F-C-8000 SERIES NOTE 5				F-C-8000 SERIES NOTE 5	F-C-8000 SERIES NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING											
	T RATING		EQUAL TO F RATING (NOTE 9)											
	ADDITIONAL REQUIREMENTS		NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	
FLOOR **POURED CONC.** ANY THICKNESS	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	C-AJ-0000 SERIES, F-A-0000 SERIES OR NOTE 4	C-AJ-1000 OR F-A-1000 SERIES	C-AJ-2000 OR F-A-2000 SERIES	C-AJ-3000 OR F-A-3000 SERIES	C-AJ-4000 OR F-A-4000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-AJ-7000 OR F-A-7000 SERIES	??		NOTE 8
		MULTIPLE PENETRANTS		C-AJ-8000 OR F-A-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-AJ-8000 OR F-A-8000 SERIES - NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING											
	T RATING		EQUAL TO F RATING (NOTE 9)											
	ADDITIONAL REQUIREMENTS		NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	
FLOOR **POURED CONC.** MINIMUM THICKNESS GREATER THAN FIVE INCHES	UL CLASSIFIED SYSTEM	SINGLE PENETRANT	C-BJ-0000 SERIES OR NOTE 4	C-BJ-1000 OR F-B-1000 SERIES	C-BJ-2000 OR F-B-2000 SERIES	C-BJ-3000 OR F-B-3000 SERIES	C-BJ-4000 OR F-B-4000 SERIES	C-BJ-5000 OR F-B-5000 SERIES	C-AJ-5000 OR F-A-5000 SERIES	C-AJ-6000 SERIES	C-BJ-7000 OR F-B-7000 SERIES	??		NOTE 8
		MULTIPLE PENETRANTS		C-BJ-8000 OR F-B-8000 SERIES -- NOTE 5				C-AJ-8000 OR F-A-8000 SERIES - NOTE 5	C-BJ-8000 OR F-B-8000 SERIES - NOTE 5		N/A	N/A		
	F RATING		EQUAL TO BARRIER RATING											
	T RATING		EQUAL TO F RATING (NOTE 9)											
	ADDITIONAL REQUIREMENTS		NONE	NONE	NONE	NONE	NONE	NONE	NOTE 6	NONE	NOTE 7	NONE	NONE	

THIS SCHEDULE USES THE IDENTIFICATION SYSTEMS OF UNDERWRITERS LABORATORIES, INC. AS DEFINED IN THEIR "FIRE RESISTANCE DIRECTORY" AND AS USED BY MANUFACTURERS ON THEIR UL CLASSIFIED SYSTEM.

INDICATED RATINGS MAY BE EXCEEDED. "N/A" = NOT APPLICABLE

NOTES

1. EXAMPLES OF SYSTEMS THAT OPERATE BETWEEN 32 DEGF (0DEGC) AND 122 DEGF (50 DEGC):

	DOMESTIC HOT WATER
CHILLED WATER	LESS THAN 122 DEGF (50
SUPPLY & RETURN	DEGC)
	DOMESTIC HOT WATER
HEAT PUMP WATER	RECIRCULATION LESS THAN
SUPPLY & RETURN	122 DEGF (50 DEGC)

DOMESTIC COLD WATER

2. EXAMPLES OF SYSTEMS OPERATING BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC):

STEAM SUPPLY &	HEATING HOT WATER
RETURN	SUPPLY & RETURN
	HOT-CHILLDED WATER
STEAM VENT	SUPPLY & RETURN
CONDENSATE PUMP	GLYCOL HEATING HOT
DISCHARGE	WATER SUPPLY & RETURN
	DOMESTIC HOT WATER
BOILER BLOW DOWN	SUPPLY 140 DEGF (60 DEGC)
	DOMESTIC HOT WATER
	RECIRCULATION 140 DEGF
CRYOGENIC VENT	(60 DEGC)

3. EXAMPLES OF OTHER RECESSED DEVICES:

MEDICAL GAS ZONE	
VALVES	UNIT HEATERS
MEDICAL GAS OUTLETS	FIRE FIGHTERS' PHONE
	FIRE EXTINGUISHER
FIRE VALVE CABINETS	CABINET

FIRE HOSE CABINETS

4. SEAL OPENING USING BARRIER'S ORIGINAL CONSTRUCTION.
5. WHERE A SERIES 8000 CLASSIFIED SYSTEM IS NOT AVAILABLE, INSTALL PENETRANTS SINGLY, AND PROVIDE SINGLE-PENETRANT SYSTEMS.
6. FOR SYSTEMS THAT OPERATE BELOW 32 DEGF (0DEGC) OR ABOVE 122 DEGF (50 DEGC), COMPLY WITH THE FOLLOWING ADDITIONAL REQUIREMENTS:
   A. PROVIDE TPFS SYSTEM USING INTUMESCENT ELASTOMERIC WRAP STRIP AS ITS FILL, VOID, OR CAVITY MATERIAL.
   B. DO NOT USE SERIES 8000 PENETRATIONS. PROVIDE ONLY SINGLE PENETRATIONS.
7. FOR PENETRATIONS PROTECTED WITH DAMPERS, PROVIDE TPFS SYSTEM APPROVED BY DAMPER MANUFACTURER.
8. WHERE UL CLASSIFIED SYSTEMS ARE NOT AVAILABLE FOR OTHER RECESSED DEVICES, MAINTAIN CONTINUITY OF RATED BARRIER CONSTRUCTION AROUND RECESS.
9. PROVIDE PILLOW TYPE FIRESTOP SYSTEM TO FILL VOIDS IN CABLE TRAYS AT COMPUTER SERVER ROOMS, AND WHERE INDICATED AS "FREQUENTLY MODIFIED" LOCATIONS.
10. **THE USE OF GYPSUM PRODUCTS IS STRICTLY PROHIBITED.**

NOTE
:
For Project Closeout, submit a list of systems installed, the UL numbers, and the location of each system. The submittal must have the installer's signature.

END OF SECTION 078413

SECTION 07 84 43 - FIRE-RESISTANT JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fire-resistive joint systems for the following:

1. Floor-to-floor joints.
2. Floor-to-wall joints.
3. Head-of-wall joints.
4. Wall-to-wall joints.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide fire-resistive joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of assembly in which fire-resistive joint systems are installed.

B. Joint Systems in and between Fire-Resistance-Rated Constructions: Provide systems with assembly ratings equaling or exceeding the fire-resistance ratings of construction that they join, indicated as determined by UL 2079.

C. Perimeter Fire-Resistive Joint Systems: For joints between edges of fire-resistance-rated floor assemblies and exterior curtain walls, provide systems of type and with ratings indicated below and those indicated in the Fire-Resistive Joint System Schedule at the end of Part 3, as determined by NFPA 285 and UL 2079.

1. UL-Listed, Perimeter Fire-Containment Systems: Integrity ratings equaling or exceeding fire-resistance ratings of floor or floor/ceiling assembly forming one side of joint.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Fire Resistive Joint System Schedule: Submit, for information only, a fire resistive joint system schedule indicating the type of fire resistive joint system to be installed for each joint. Indicate each kind of construction condition in which joints are installed; also show relationships to adjoining construction. Include fire-resistive joint system design designation of testing and inspecting agency acceptable to authorities having jurisdiction that demonstrates compliance with requirements for each condition indicated.

1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each fire-resistive joint system configuration for construction and penetrating items.

C. Product Certificates: Submit product certificates signed by product manufacturers of fire resistive joint systems certifying that products furnished comply with requirements.

D. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual certified or licensed, by the fire resistive joint system manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its fire resistive joint system materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Source Limitations: Obtain fire-resistive joint systems, for each kind of joint and construction condition indicated, through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Fire-resistance tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL or another agency performing testing and follow-up inspection services for fire-resistive joint systems acceptable to authorities having jurisdiction.
2. Fire-resistive joint systems are identical to those tested per methods indicated in Part 1 "Performance Requirements" Article and comply with the following:

    a. Fire-resistive joint system products bear classification marking of qualified testing and inspecting agency.
    b. Fire-resistive joint systems correspond to those indicated by referencing system designations of the qualified testing and inspecting agency.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver fire-resistive joint system products to Project site in original, unopened containers or packages with qualified testing and inspecting agency's classification marking applicable to Project and with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials for fire-resistive joint systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install fire-resistive joint systems when ambient or substrate temperatures are outside limits permitted by fire-resistive joint system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.

B. Ventilate fire-resistive joint systems per manufacturer's written instructions by natural means or, if this is inadequate, forced-air circulation.

1.7 COORDINATION

A. Coordinate construction of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

B. Coordinate sizing of joints to accommodate fire-resistive joint systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, provide fire-resistive joint systems indicated for each application in the Fire-Resistive Joint System Schedule at the end of Part 3.

2.2 FIRE-RESISTIVE JOINT SYSTEMS

A. Compatibility: Provide fire-resistive joint systems that are compatible with joint substrates, under conditions of service and application, as demonstrated by fire-resistive joint system manufacturer based on testing and field experience.

B. Accessories: Provide components of fire-resistive joint systems, including primers and forming materials, that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by fire-resistive joint system manufacturer and approved by the qualified testing and inspecting agency for systems indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for joint configurations, substrates, and other conditions affecting performance of work.

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

3.2 PREPARATION

A. Surface Cleaning: Clean joints immediately before installing fire-resistive joint systems to comply with fire-resistive joint system manufacturer's written instructions and the following requirements:

1. Remove from surfaces of joint substrates foreign materials that could interfere with adhesion of fill materials.
2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with fill materials. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by fire-resistive joint system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent fill materials of fire-resistive joint system from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from fire-resistive joint system materials. Remove tape as soon as possible without disturbing fire-resistive joint system's seal with substrates or damaging adjoining surfaces.

3.3 INSTALLATION

A. General: Install fire-resistive joint systems to comply with Part 1 "Performance Requirements" Article and fire-resistive joint system manufacturer's written installation instructions for products and applications indicated.

B. Install forming/packing/backing materials and other accessories of types required to support fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

C. Install fill materials for fire-resistive joint systems by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings and forming/packing/backing materials as required to achieve fire-resistance ratings indicated.
2. Apply fill materials so they contact and adhere to substrates formed by joints.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 FIELD QUALITY CONTROL

A. Inspecting Agency: Owner may engage a qualified independent inspecting agency to inspect fire-resistive joint systems and prepare inspection reports.

1. Inspecting agency shall state in each report whether inspected fire-resistive joint systems comply with or deviate from requirements.

B. Proceed with enclosing fire-resistive joint systems with other construction only after inspection reports are issued.

C. Where deficiencies are found, repair or replace fire-resistive joint systems so they comply with requirements.

3.5 CLEANING AND PROTECTING

A. Clean off excess fill materials adjacent to joints as Work progresses by methods and with cleaning materials that are approved in writing by fire-resistive joint system manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure fire-resistive joint systems are without damage or deterioration at time of Substantial Completion. If damage or deterioration occurs despite such protection, cut out and remove damaged or deteriorated fire-resistive joint systems immediately and install new materials to produce fire-resistive joint systems complying with specified requirements.

3.6 FIRE-RESISTIVE JOINT SYSTEM SCHEDULE

A. Designation System for Joints in or between Fire-Resistance-Rated Constructions: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHBN.

B. Designation System for Joints at the Intersection of Fire-Resistance-Rated Floor or Floor/Ceiling Assembly: Alphanumeric systems listed in UL's "Fire Resistance Directory" under Product Category XHDG:

C. Floor-to-Floor Fire-Resistive Joint Systems: UL Classified (FF- Series) System as required to maintain floor fire rating indicated.

D. Floor-to-Wall Fire-Resistive Joint Systems: UL Classified (FW- Series) System as required to maintain floor to wall fire rating indicated.

E. Head-of-Wall Fire-Resistive Joint Systems: UL Classified (HW- Series) System as required to maintain wall fire rating indicated.

F. Wall-to-Wall Fire-Resistive Joint Systems: UL Classified (WW- Series) System as required to maintain wall fire rating indicated.

END OF SECTION 07 84 46

SECTION 07 92 00 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes sealants for the following applications:

1. Exterior joints in the following vertical surfaces and nontraffic horizontal surfaces:

    a. Control and expansion joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and frames of doors and windows.
    f. Other joints as indicated.

2. Exterior joints in the following horizontal traffic surfaces:

    a. Control, expansion, and isolation joints in cast-in-place concrete slabs.
    b. Tile control and expansion joints.
    c. Joints between different materials listed above.
    d. Other joints as indicated.

3. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Perimeter joints of exterior openings where indicated.
    c. Tile control and expansion joints.
    d. Vertical control joints on exposed surfaces of interior unit masonry and concrete walls and partitions.
    e. Joints on underside of precast beams and planks.
    f. Perimeter joints between interior wall surfaces and frames of interior doors, windows, and elevator entrances.
    g. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    h. Other joints as indicated.

4. Interior joints in the following horizontal traffic surfaces:

    a. Control and expansion joints in cast-in-place concrete slabs.
    b. Control and expansion joints in tile flooring.
    c. Other joints as indicated.

B. Single Subcontract Responsibilities: Refer to Section 08 44 13, “Glazed Aluminum Curtain Walls,” for requirements applicable to single subcontract responsibility.

1.2 SUBMITTALS

A. Product Data: Submit product data for each joint-sealant product indicated and the following:

1. Written certification from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use(s) indicated as verified through manufacturer's in-house testing laboratory.

a. Test results for all job specific concealed and exposed (custom colored) sealants confirming compatibility and adhesion are mandatory for all materials in contact with exterior glazing, curtain wall components, metal panels, prior to mock-up and testing.
b. Complete instructions for handling, storage, mixing, priming, installation, curing and protection of each type of sealant.

2. Laboratory and field test results confirming compatibility and/or adhesion for specific materials proposed for application.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For sealants and sealant primers used inside the weatherproofing system, including printed statement of VOC content.

C. Samples: Submit samples of each type and color of exposed joint sealant required. Provide fully cured joint sealant samples in 3/4-inch (19-mm-) wide joints 12-inches (300-mm-) long formed between two strips of material to be sealed as they will appear on the project.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Exposed sealant work including, but not limited to, sealants used for air and weatherseals which are external to curtain wall systems at their perimeter, metal panel to panel joints, decorative concrete masonry unit to decorative concrete masonry unit, joints shall be performed by one firm specializing in the installation of sealants who has successfully produced work comparable to this project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years. Concealed sealant work (sealants which are internal to metal framed curtain wall systems, and providing an air seal) shall be the responsibility of the subcontractor providing erection of the respective system.

B. Source Limitations: Obtain each type of joint sealant from a single manufacturer.

C. Preconstruction Compatibility and Adhesion Testing (All Exterior Wall Sealants Only): Submit to joint sealant manufacturers, prior to full size building mock-up(s), samples of materials that will contact or affect, by direct or indirect chemical or mechanical means, exterior wall joint sealants for compatibility and adhesion testing below.

1. General: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, other sealants, flashings, metal framing, metal panel cladding, decorative concrete masonry unit, and shims, prior to full size mock-up and testing.

a. Schedule sufficient time for testing and analysis of results to prevent delay in the progress of the work.

1) It is anticipated that a minimum of 3 months will be required to complete preconstruction sealant compatibility and adhesion testing.

b. Investigate materials that fail compatibility and adhesion testing and obtain sealant manufacturer's written recommendations for corrective measures, which may include the use of primers, cleaners, cleaning measures, curing time, temperature limitations (surface and air), humidity conditions, moisture content of substrate, etc.

c. Definitions:

1) Compatibility: The capability of the sealant materials and substrates to be placed in direct contact with each other and maintain their required physical, chemical and visual qualities with the absence of softening, staining, oil exudation, discoloration or other detrimental, deleterious or degradative effects caused by chemical interactions.
2) Adhesion: The mechanical or chemical ability of the sealant materials and substrates to adhere or bond together at their interface.

d. Specimen Sizes and Shapes: As required by the manufacturer's testing laboratory for the tests listed, unless otherwise specified.

2. Tests Required:

a. Adhesion in Peel Testing:

1) Test Methods:

a) Comply with ASTM C794 'Adhesion and Peel of Elastomeric Joint Sealants', modified to include project specific substrates and to report cohesive or adhesive failure mode. Samples of each exterior decorative concrete masonry unit, metal cladding, other sealants, flashings, metal framing in contact with the concealed and exposed sealant materials are required to be tested.

2) All specimens shall be tested for primed and unprimed performance.

3) Report:

a) Date(s) of testing.
b) Project identification.
c) Test method (as identified herein).
d) Specimen substrate(s) tested.
e) Sealant(s) tested.
f) Substrate preparation (cleaning materials, methods and primers used).
g) Test results for each specimen tested (type of failure - adhesive or cohesive - force measured at failure in pounds per lineal inch).

h) Recommendations. Where testing shows equal or better performance without a primer, a primer will not be required.
i) Additional remarks, if any (i.e., color change of substrate or sealant, bubbles, or sealant softening).

b. Compatibility Testing: This test method describes an accelerated laboratory procedure to determine if the proposed sealant materials and substrates are compatible.

1) Test Methods:

a) Comply with ASTM C1248 'Staining of Porous Substances by Joint Sealants', modified to include project specific substrates. Samples of each exterior decorative concrete masonry unit, and other sealants, in contact with the concealed and exposed sealant materials are required to be tested.

2) All specimens for ASTM C1248 testing shall be tested for primed and unprimed performance.

3) Report:

a) Date(s) of testing.
b) Project identification.
c) Test method (as identified herein).
d) Substrate preparation (cleaning materials, methods and primers used).
e) Name of sealant, type of sealant, rated movement capability and identifying batch number.
f) Substrates used.
g) Testing Equipment: Manufacturer of apparatus, type of lamps.
h) Statement describing curing conditions if other than at standard conditions.
i) Description of, and reasons for, any variations from the test procedure.
j) Description of test effects observed, such as change in finished surface appearance, discoloration into the substrate, adhesion failure, or other characteristics; average measurement of stain width and depth.
k) Recommendations. Where testing shows equal or better performance without a primer, a primer will not be required.
l) Additional remarks, if any.

c. Preconstruction Field-Adhesion Testing: Before installing exposed exterior elastomeric sealants, field test their adhesion to joint substrates as follows:

1) Locate test joints where indicated or, if not indicated, as directed by Architect.
2) Conduct field tests for each type of exposed exterior elastomeric sealant and joint substrate indicated.
3) The Architect and manufacturer’s technical representative, shall be present when joints are tested.

4) Test Method: Test exterior elastomeric joint sealants by hand-pull method described below:

a) Install joint sealants in 60-inch (1500-mm-) long joints using same materials and methods for joint preparation and joint-sealant installation in accordance with manufacturers final laboratory testing recommendations. Allow sealants to cure.
b) Make knife cuts from one side of joint to the other, followed by two cuts approximately 3-inch (75 mm) long at sides of joint and meeting cross cut at one end. Place a mark 1-inch (25 mm) from cross-cut end of 3-inch (75-mm) piece.
c) Use fingers to grasp 3-inch (75-mm) piece of sealant between cross-cut end and 1-inch (25-mm) mark; pull firmly down at a 90-degree angle to the joint and hold sealant in this position for ten seconds; following the ten second time duration pull sealant at a 180 degree angle parallel to the joint and hold the sealant in this position for ten seconds. Pull sealant away from joint to the distance recommended by sealant manufacturer for testing adhesion.
d) Repair joint as recommended by the sealant manufacturer.

5) Sealants not evidencing adhesive failure with substrate during testing will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

3. Report: Provide written summary of each compatibility and adhesion test.

D. Mock-ups and Sample Installations: Provide mock-ups and sample installations of sealants at locations indicated or required by the Architect. Mock-ups and sample installations shall represent the primary types of materials, substrate surfaces, joint size, exposure, and other conditions to be encountered in the work. Preparation, priming, application, and curing, shall comply with manufacturer's recommendations and actual proposed methods. Schedule the applications, with allowance for sufficient curing time, so that samples may be examined and any necessary adjustments made at least 1 week prior to date scheduled for commencing installation of the work.

1. The mock-ups and sample installations shall be visually examined for staining, dirt pickup, shrinkage, color, general workmanship and appearance. Cut and pull the sealant from each sample joint to examine for internal bubbles or voids, adhesion, and general compatibility with substrate.

2. Mock-ups and sample installations are required in conjunction with the following:

a. Section 04 22 00, ‘Unit Masonry Assemblies’.
b. Section 08 44 13, ‘Glazed Aluminum Curtain Walls’.

E. Preinstallation Conference: As soon as possible after award of exterior joint sealant work, but no later than 2 weeks before the installation of the joint sealants, meet with Installer, Owner, Architect, installers of the substrate construction, and other work adjoining joint sealants and representatives of any other entities directly concerned with joint sealant performance. Conduct conference at Project site to comply with the following:

1. Review foreseeable methods and procedures related to sealing substrates, including but not limited to, the following:

    a. Discuss substrates to be sealed, discuss as fabricated and installed condition of substrate, sealant application, flashing details, and other preparatory work.
    b. Review joint sealant requirements: drawings, specifications, and other contract documents.
    c. Review required submittals, both complete and incomplete
    d. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions.
    e. Review schedule and intended sequence of work.

2. Record discussion and furnish copy of recorded discussions to each attendee.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.

B. Store and handle materials in compliance with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 40 deg F (4.4 deg C).
2. When joint substrates are wet.

B. Joint-Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

C. Joint-Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.6 WARRANTY

A. Special Installer's Warranty: The Warranty for the sealants required in the curtainwall work shall be from the Curtain Wall Subcontractor. In the event that the curtain wall sealant application is subcontracted by the Curtain Wall Subcontractor then the Subcontractor shall provide, in addition to but not in replacement of the Warranty from the Curtain Wall Contractor, a “Special Installer’s Warranty”. Copy of the proposed warranty shall be included with the Bidder’s Proposal. Written warranty, signed by Installer agreeing to repair or replace

elastomeric joint sealant work which has failed to provide a weathertight system within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Manufacturer's Warranties: Written warranties (weatherseal and stain resistance), signed by elastomeric sealant manufacturer agreeing to furnish and install (full labor and material) elastomeric joint sealants to repair or replace those that fail to provide airtight and watertight joints, or fail in adhesion, cohesion, abrasion-resistance, stain-resistance, weather resistance, or general durability or appear to deteriorate in any other manner not clearly specified in the manufacturer's data as an inherent quality of the material within specified warranty period. Copy of the proposed warranty shall be included with the Bidder’s Proposal.

1. Warranty Period: 20 years from date of Substantial Completion.

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 stated by sealant manufacturer’s published data, and as substantiated by the manufacturer for each application through testing.

B. Colors: For fully concealed joints, provide manufacturer’s standard color of sealant which has the best overall performance characteristics for the application shown. For exposed joints provide custom colors to match Architect's samples of the following:

1. Exterior metal framed window and curtain wall framing, each color.
2. Decorative masonry units, each color.
3. Metal panels, each color.
4. Walks and pavings, each color.
5. Exterior field applied paints and coatings, each color.
6. Other exterior materials or colors, as indicated.

C. Manufacturer’s Representative: Do not use elastomeric sealant produced by any manufacturer who will not agree to send a qualified technical representative to the project site when requested, for the purpose of rendering advice concerning the proper installation of manufacturer’s materials.

2.2 ELASTOMERIC JOINT SEALANTS

A. General: Use self leveling compounds for horizontal joints in pavements and non-sag compounds for all other areas except as shown or specified.

B. Silicone Sealants (Non-Sag):

1. Typical Exterior Wall Joints (Silicone Sealants):

a. Properties:

1) Standards: Comply with ASTM C920, Type S, Grade NS, Class 25; use NT, M, A and O.
2) Performance: Non-stain, non-bleed, non-streaking to sealed and adjacent substrates. The minimum pli value after 7 day immersion shall not be less than 13 when tested in strict accordance with ASTM C794 Adhesion in Peel.
3) Cure System and Oil Content: Neutral-Cure, low or medium modulus, system specifically manufactured with no oils or with controlled oil content to eliminate oil migration into sealed substrates and residue rundown over and onto adjacent substrates.

b. Products and Manufacturers: One of the following:

1) 756 SMS; Dow Corning.
2) Spectrum 1 for metal to metal joints and either Spectrum 3 or Spectrum 4 for all other joints; Tremco, an RPM Co.

C. Two-Part Polyurethane Sealant (Self Leveling): ASTM C920, Type M, Grade P, Class 25; use T; one of the following:

1. Pecora Corporation; Urexpan NR-200.
2. Sonneborn Building Products Div., ChemRex, Inc.; Sonolastic SL 2 ™.
3. Tremco, an RPM Co.; THC 900.

D. Mildew-Resistant Silicone Sealant (use for joints at plumbing fixtures, toilet room countertops and vanities, and at janitor closet mop receptor to wall transition): Complying with ASTM C920, Type S (single component), Grade NS (non-sag), class 25, Use NT (non-traffic), Substrate uses G, A, and O; and containing a fungicide for mildew resistance.

1. Products: Provide one of the following:

a. Dow Corning; 786 Mildew Resistant Silicone Sealant.
b. Pecora Corporation; 898 Silicone Sanitary Sealant.
c. Tremco, an RPM Co.; Tremsil 200.

2.3 LATEX JOINT SEALANTS

A. Latex Sealant: Non-elastomeric, one part, non-sag, paintable latex sealant that is recommended for exposed applications on the interior. Complying with ASTM C 834, Type P (opaque sealants), Grade NF.

1. Products: Provide one of the following:

a. Pecora Corporation; AC-20 + Silicone
b. Sonneborn Building Products Div., ChemRex, Inc.; Sonolastic Sonolac.
c. Tremco, an RPM Co.; Tremflex 834.

2.4 JOINT-SEALANT BACKING

A. General: Provide sealant backings of material and type 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: One of the following preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding backings of flexible plastic foam complying with ASTM C 1330, and of type indicated below. Select shape and density of cylindrical sealant backings in consultation with the manufacturer for proper performance in specific condition of use in each case.

1. Type C: Closed-cell polyethylene foam material with a surface skin, which is nonabsorbent to liquid water and gas, non-outgassing in unruptured state; one of the following:

   a. HBR Closed Cell Backer Rod; Nomaco, Inc..
   b. Sonneborn Sonolastic Closed-Cell Backer-Rod; ChemRex, Inc.

2. Type B: Bi-cellular reticulated, polymeric foam material with a surface skin, nonoutgassing, with a density of between 24-48 kg/cubic meter per ASTM D1622 and minimum tensile strength of greater than 200 kPa per ASTM D1623, and with water absorption less than 0.10 gm/cc per ASTM C1016; one of the following:

   a. SofRod; Nomaco, Inc.
   b. Sonolastic Soft Backer-Rod; ChemRex, Inc.

C. Backer Strips for Cold- and Hot-Applied Jet Fuel Resistant Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depths, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

D. Bond-Breaker Tape: Polyethylene, TFE fluorocarbon, 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 where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

E. Weep and Vent Tubes: Clear plastic (PVC) tubing, minimum 1/4 inch (6.35 mm) inside diameter, and of length as required to extend between exterior face of sealant and open cavity behind.

1. At window and curtain wall systems, where required by system designer, provide gutter termination of tube with preformed nipples suitable for sealing to gutter.

F. Cork Joint Filler: Resilient and nonextruding, ASTM D1752, Type II.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended, as verified through compatibility and adhesion testing, by joint sealant manufacturer for the substrates indicated to be sealed.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and which will not stain nor mar the finish of surfaces adjacent to joints to which it is applied.

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. 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 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), oil, grease, water, surface dirt, and frost.
2. Clean concrete, masonry, unglazed surfaces of tile, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
3. Remove laitance and form-release agents from concrete.
4. Clean metal, glass, porcelain enamel, glazed surfaces of tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming (Elastomeric Sealants Only): Prime joint substrates with primers selected through the preconstruction compatibility and adhesion testing. 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 beyond bond area or onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant 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. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install sealant backings of type 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.

    a. Do not leave gaps between ends of sealant backings. Trim for tight fit around obstructions or elements penetrating the joint.
    b. Do not stretch, twist, puncture, or tear sealant backings.
    c. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry sealant backings.

2. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and back of joints.
3. Install weeps and vents into joints at the same time sealants are being installed. Unless otherwise shown on the drawings, or directed by the Architect, locate weeps and vents spaced as recommended by the sealant manufacturer and the window and curtain wall fabricator and erector. Do not install vents at horizontal joints immediately below shelf angles, sills, and through wall flashings.

C. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

1. Apply sealants in the depth shown or, if none is shown, apply in accordance with the manufacturer's recommendations and the following general proportions and limitations:

    a. Apply elastomeric sealants in sidewalk, pavement and similar horizontal joints to a depth equal to 75% of the joint width, but not less than 3/8 inch (10 mm) and not more than 3/4 inch (19 mm).
    b. Apply elastomeric sealants, in joints not subject to traffic or other abrasion, to a depth equal to 50% of the joint width, but not less than 1/4 inch (6 mm) and not more than 1/2 inch (13 mm).
    c. Apply non-elastomeric sealants to a depth approximately equal to the joint width.

2. Pour self leveling sealants to a depth approximately equal to the joint width.

D. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants to form smooth, uniform, beads to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces. Tool exposed surfaces of sealants to the profile shown, or if none is shown, tool slightly concave.

1. Use masking tape to protect adjacent surfaces of recessed tooled joints.

2. Provide a slight wash on horizontal joints where horizontal and vertical surfaces meet.
3. Against rough surfaces or in joints of uneven widths avoid the appearance of excess sealant or compound by locating the compound or sealant well back into joint wherever possible.

3.4 CLEANING

A. Clean off excess sealants 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 the original work.

END OF SECTION 07 92 00

SECTION 08 11 00 - STEEL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel doors and frames.

1. The integration of a security system into the steel door and frame work is required. The Contractor shall be responsible for the total and complete coordination of the security system components into the Work.

1.2 SUBMITTALS

A. Product Data: Submit product data for each product indicated. Include material descriptions, core descriptions, label compliance, sound and fire-resistance ratings, and finishes for each type of door and frame specified.

B. Shop Drawings: Submit door and frame schedule using same reference designations indicated on Drawings. Include opening size(s), handing of doors, frame throat dimensions, details of each frame type, elevations of door design types, details of construction, location and installation requirements of door hardware and reinforcements, hardware group numbers, details of joints and connections, fire label requirements including fire rating time duration, maximum temperature rise requirements, and smoke label requirements.

1. Indicate routing of electrical conduit and dimensions and locations of cutouts in doors and frames to accept electric hardware devices.

C. Stainless Steel Samples: Submit of each type of exposed finish required, prepared on samples not less than 12 by 12 inches (300 by 300 mm) and of same thickness and material indicated for the Work.

D. Construction Samples, approximately 18 by 24 inches (450 by 600 mm), representing the required construction of doors and frames for Project.

1. Doors: Show vertical-edge, top, and bottom construction; insulation; face stiffeners; and hinge and other applied hardware reinforcement. Include louver section and glazing stops.
2. Welded Frames: Show profile, welded corner joint, welded hinge reinforcement, dust-cover boxes, floor and wall anchors, stops, and silencers. Include panel and louver sections and glazing stops if applicable.

E. Certificate of Compliance for Fire Rated Doors: Provide copies of Certificate of Compliance for all fire rated door assemblies, all smoke and draft control door assemblies, and all temperature rise rated door assemblies.

F. Oversize Construction Certification: For door assemblies required to be fire rated and exceeding limitations of labeled assemblies, submit certification of a testing agency acceptable

to authorities having jurisdiction that each door and frame assembly has been constructed to comply with design, materials, and construction equivalent to requirements for labeled construction.

G. Submittals for LEED-NC:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.

    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.3 QUALITY ASSURANCE

A. Steel Door and Frame Standard: Comply with the applicable provisions and recommendations of the following publications by Hollow Metal Manufacturers Association (HMMA) Div. of National Association of Architectural Metal Manufacturers (NAAMM), unless more stringent requirements are indicated in the Contract Documents:

1. HMMA “Hollow Metal Manual”.
2. HMMA 861 “Guide Specifications for Commercial Hollow Metal Doors and Frames”.
3. HMMA 866 “Guide Specifications for Stainless Steel Hollow Metal Doors and Frames.”

B. Manufacturer Qualifications: A firm experienced in manufacturing steel doors and frames 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.

C. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 252.

1. Provide metal labels permanently fastened on each door which is within the size limitations established by the labeling authority having jurisdiction.
2. Temperature-Rise Rating: Where indicated, provide doors that have a temperature-rise rating of 450 deg F (250 deg C) maximum in 30 minutes of fire exposure.
3. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

D. Fire-Rated Window Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to NFPA 257 or UL 9.

E. Smoke-Control Door Assemblies: Comply with NFPA 105 or UL 1784.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver doors and frames palleted, wrapped, or crated to provide protection during transit and Project site storage.

B. Inspect doors and frames, on delivery, for damage. Tool marks, rust, blemishes, and any other damage on exposed surfaces will not be acceptable. Remove and replace damaged items as directed by Architect. Store doors and frames at building site in a dry location, off the ground, and in such a manner as to prevent deterioration.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Specified Gage Thickness: All specified gauge thicknesses are Manufacturer's Standard Gauge.

B. Hot-Rolled Steel Sheets: ASTM A 1008/A 1008M, CS (commercial steel), Type B; free of scale, pitting, or surface defects; pickled and oiled. Not less than 16 gauge (0.053 inch) (1.3 mm) thick where frames are indicated to be built into exterior walls, hot dip galvanize after fabrication in compliance with ASTM A153/A153M, Class B.

C. Cold-Rolled Steel Sheets: ASTM A 1011/A 1011M, CS (commercial steel), Type B, free from scale, pitting, coil breaks, or other defects, exposed (matte) dull finish.

D. Metallic-Coated Steel Sheets: ASTM A653/A653M, CS (commercial steel), Type B; with G60 (Z180) zinc (galvanized) or A60 (ZF180) zinc-iron-alloy (galvannealed) coating, mill phosphatized.

E. Stainless-Steel Sheets: ASTM A 666, austenitic stainless steel, Type 304.

F. Inserts, Bolts, and Fasteners: Galvanized steel.

1. Expansion Bolts and Shields: FS FF-S-325, Group III, Type 1 or 2.
2. Machine Screws: FS FF-S-92, carbon steel, Type III cross recessed, design I or II recess, style 2C flat head.

G. Filler: Sound deadening and heat retarding mineral fiber insulating material.

H. Glass and Glazing: Refer to Division 8 Section 'Glazing'.

2.2 DOORS

A. General: Provide flush-design doors, 1-3/4 inches (44 mm) thick, of seamless hollow construction, unless otherwise indicated. Construct doors with sheets joined at their vertical edges by continuous welding the full height of the door, with no visible seams on their faces or vertical edges, and all welds ground and finished flush.

1. Visible joints or seams around glazed or louvered panel inserts are permitted.
2. For single-acting swing doors, bevel both vertical edges 1/8 inch in 2 inches (3 mm in 50 mm).
3. For double-acting swing doors, round vertical edges with 2-1/8-inch (54-mm) radius.

B. Interior Door Core Construction: Provide one of the following core constructions welded to both door faces:

1. Steel-Stiffened Core: 20 gauge (0.032-inch) (0.8-mm) steel vertical stiffeners extending full-door height, spaced not more than 6 inches (150 mm) apart and spot welded to face sheets a maximum of 5 inches (127 mm) o.c. Place filler between stiffeners for full height of door.
2. Continuous Truss-Form Inner Core: 28 gauge thick steel reinforcement spot welded to face sheets a maximum of 2-3/4 inches (69.9 mm) o.c. vertically and horizontally.

C. Exterior Door Core Construction: Polystyrene core adhered to face sheets with waterproof adhesive.

D. Fire Door Cores: A continuous mineral fiberboard core permanently bonded to the inside face of the outer face sheet unless otherwise required to provide fire-protection and temperature-rise ratings indicated.

E. Astragals: As required by NFPA 80 to provide fire ratings indicated.

F. Top and Bottom Channels: Spot weld metal channels, having a thickness of not less than thickness of face sheet, not more than 6 inches (150 mm) o.c. to face sheets.

1. Reinforce tops and bottoms of doors with inverted horizontal channels of same material as face sheet so flanges of channels are even with bottom and top edges of face sheets.
2. For exterior doors, close bottom edge with metallic-coated steel closing channel and top edge with filler channel of same material, so webs of channels are flush with bottom and top door edges. Weld inverted steel channels to both face sheets or form integrally with edge construction of door.

G. Hardware Reinforcement: Fabricate reinforcing from the same material as door to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with door surfaces.

1. Hinges and Pivots: 7 gauge (0.167 inch) (4.2 mm) thick by 1-1/2 inches (38 mm) wide by 9 inches (229 mm).
2. Lock Front, Strike, and Flushbolt Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick by size as required by hardware manufacturer.
3. Lock Reinforcement Units: 14 gauge (0.067 inch) (1.7 mm) thick by size as required by hardware manufacturer.
4. Closer Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick one piece channel by size as required by hardware manufacturer.

5. Other Hardware Reinforcements: As required for adequate strength and anchorage.
6. In lieu of reinforcement specified, hardware manufacturers recommended reinforcing units may be used.
7. Exit Device Reinforcements: 0.250 inch (6.35 mm) thick by 10 inches (245 mm) high by 4 inches (101 mm) wide centered on exit device case body, unless otherwise recommended by exit device manufacturer.

H. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.

1. Provide all cutouts and reinforcements required for steel doors to accept security system components.
2. Doors with Electric Hinges and Pivots: Provide with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.

    a. Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

I. Interior Steel Doors:

1. Typical Interior Doors: Flush design with 18 gauge (0.042-inch-) (1.06-mm-) thick cold-rolled stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets.
2. Extra Heavy Use Doors: Flush design with 16 gauge (0.053-inch-) (1.3-mm-) thick cold-rolled, stretcher-leveled steel face sheets and other metal components from hot- or cold-rolled steel sheets. Provide only where indicated in the remarks column of the door and frame schedule.

J. Exterior Steel Doors: Flush design with 16 gauge (0.053-inch-) (1.3-mm-) thick metallic-coated stretcher leveled steel face sheets and other metal components from metallic coated steel sheets. Provide weep-hole openings in bottom of doors to permit entrapped moisture to escape.

K. Stainless-Steel Doors: Fabricate face sheets of doors from two 16 gauge thick, stainless-steel sheets permanently and continuously bonded to nonmetallic core.

1. Honeycomb Core: Resin-impregnated kraft paper with maximum 1-inch (25.4-mm) cells and minimum 42-psi (290-kPa) crushing strength.

2. Reinforce tops and bottoms of doors with 18 gauge (0.042-inch-) (1.06-mm-) thick, stainless-steel horizontal channels.

2.3 PANELS

A. Provide panels of same materials, construction, and finish as specified for doors.

2.4 FRAMES

A. Fabricate steel door frames, formed to profiles indicated, with full 5/8 inch (16 mm) stops, and of the following minimum thicknesses.

1. For exterior use, form frames from 14 gauge (0.067 inch) (1.7-mm-) thick, metallic-coated steel sheets.
2. For interior use, form frames from cold- rolled steel sheet of the following thicknesses:

    a. Openings up to and Including 48 Inches (1200 mm) Wide: 16 gauge (0.053 inch) (1.3 mm).
    b. Openings More Than 48 Inches (1200 mm) Wide: 14 gauge (0.067 inch) (1.7 mm).

3. Form stainless-steel door frames from 16 gauge (0.053 inch) (1.3 mm) thick, stainless-steel sheets.

B. Provide frames either saw mitered and full (continuously) profile welded, or machine mitered and full (continuously) profile welded, on back side at frame corners and stops with edges straight and true. Grind welds smooth and flush on exposed surfaces.

1. At stainless steel door frames provide a machined mitered, faces only welded on back side of frame face, combined with interlocked tab construction with edges straight and true to eliminate any weld bleed through at the exposed rabbet and stops. Grind welds smooth and flush on exposed surfaces.

C. Hardware Reinforcement: Fabricate reinforcements from same material as frame to comply with the following. Offset reinforcement so that faces of mortised hardware items are flush with surface of the frame.

1. Hinges and Pivots: 7 gauge (0.167 inch) (4.2 mm) thick by 1-1/4 inches (32 mm) wide by 10 inches (254 mm).
2. Strike, Surface Mounted Hold Open Arms, and Flushbolt Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick by size as required by hardware manufacturer.
3. Closer Reinforcements: 12 gauge (0.093 inch) (2.3 mm) thick one piece channel by size as required by hardware manufacturer.
4. Other Hardware Reinforcements: As required for adequate strength and anchorage.

D. Electrical Requirements: Make provisions for installation of electrical items specified elsewhere; arrange so wiring can be readily removed and replaced.

1. Provide all cutouts and reinforcements required for steel frames to accept security system components.
2. Frames with Electric Hinges and Pivots: Provide welded on UL listed back boxes with metal conduit or raceway to permit wiring from electric hinge or pivot to other electric door hardware.

    a. Hinge Location: Center for doors less than 90 inches (2286 mm) tall or second hinge from door bottom for doors greater than 90 inches (2286 mm); top or bottom electric hinge locations shall not be permitted.

E. Mullions and Transom Bars: Provide closed or tubular mullions and transom bars where indicated. Fasten mullions and transom bars at crossings and to jambs by butt welding.

Reinforce joints between frame members with concealed clip angles or sleeves of same metal and thickness as frame.

F. Jamb Anchors: Locate jamb anchors above hinges and directly opposite on strike jamb as required to secure frames to adjacent construction. At metal stud partitions locate the additional jamb anchor below the top hinge.

1. Masonry Construction: Adjustable, corrugated or perforated, anchors to suit frame size; formed of same material and gauge thickness as frame; at non-rated frames use friction fit T-shaped anchors, at rated frames use anchors consisting of spot welded strap and adjustable anchor; with leg not less than 2 inches (50 mm) wide by 10 inches (250 mm) long. Furnish at least the number of anchors per jamb according to the following frame heights:

   a. Three anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
   b. Four anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
   c. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

2. Metal-Stud Partitions: Metal channel stud zee anchor sized to match stud width, welded to back of frames, formed of same material and gauge thickness as frame. Provide at least the number of anchors for each jamb according to the following heights:

   a. Four anchors per jamb from 60 to 90 inches (1500 to 2250 mm) in height.
   b. Five anchors per jamb from 90 to 96 inches (2250 to 2400 mm) in height.
   c. One additional anchor per jamb for each 24 inches (600 mm) or fraction thereof more than 96 inches (2400 mm) in height.

3. In-Place Concrete or Masonry: Anchor frame jambs with minimum 3/8-inch- (9-mm-) diameter countersunk flat head bolts into expansion shields or inserts 6 inches (150 mm) from top and bottom of each jamb with intermediate anchors spaced a maximum of 26 inches (650 mm) o.c. Soffit face of frame shall be punched and dimpled to accept countersunk bolt head. Reinforce frame with spacer to prevent bowing. Bolt head shall be set slightly below soffit face, filled and ground smooth at time of installation.

G. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, formed of same material as frame, 12 gauge (0.093 inch) (2.3 mm) thick, and punched with two holes to receive two (2) 0.375 inch (9.5 mm) fasteners. Where floor fill or setting beds occur support frame by adjustable floor anchors bolted to the structural substrate. Terminate bottom of frames at finish floor surface.

H. Head Reinforcement: For frames more than 48 inches (1200 mm) wide in masonry wall openings, provide continuous steel channel or angle stiffener, 12 gauge (0.093 inch) (2.3 mm) thick for full width of opening, welded to back of frame at head. Head reinforcements shall not be used as a lintel or load bearing member for masonry.

I. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions to serve as bracing during shipment and handling and to hold frames in proper position until anchorage and adjacent construction have been completed.

J. Door Silencer Holes: Drill strike jamb stop to receive three silencers on single door frames and for two silencers on double door frames. Insert plastic plugs in holes to keep holes clear during installation.

K. Plaster Guards and Removable Access Plates: Provide 26 gauge (0.016-inch-) (0.4-mm-) thick plaster guards or dust-cover boxes of same material as frame, welded to frame at back of hardware cutouts to close off interior of openings and prevent mortar or other materials from obstructing hardware operation. Provide removable access plates in the heads of frames to receive overhead concealed door closers.

2.5 LOUVERS

A. Door Louvers: Fabricate louvers and mount into doors with overlapping moldings on surface of door face sheets. Prime paint steel louvers after fabrication.

1. Interior Louvers: Sightproof, stationary type, constructed of inverted Y-shaped blades and U shaped frames.

a. Steel: 22 gauge thick for blades, 18 ga. for frames.

2. Basis of Design: Anemostat AFDL, except omit mesh screen and mesh screen frame.

2.6 STOPS AND MOLDINGS

A. Provide continuous stops and moldings around solid, glazed, and louvered panels where indicated.

B. Form fixed stops and moldings integral with frame, on the exterior (non-secured) side of the frame.

C. Provide removable stops and moldings formed of 20 gauge (0.032-inch-) (0.8-mm-) thick steel sheets matching steel frames. Secure with countersunk oval head machine screws spaced uniformly not more than 12 inches (300 mm) o.c. Form corners with butted hairline joints.

D. Coordinate rabbet width between fixed and removable stops with type of glass or panel and type of installation indicated.

2.7 FABRICATION

A. Fabricate doors and frames rigid, neat in appearance, and free of defects, warp, wave, and buckle. Accurately form metal to sizes and profiles indicated. Accurately machine, file, and fit exposed connections with hairline joints. Weld exposed joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

B. Exposed Fasteners: Provide countersunk flat heads for exposed screws and bolts, unless otherwise indicated.

C. Hardware Preparation: Prepare doors and frames to receive hardware, including cutouts, reinforcement, mortising, drilling, and tapping, according to final hardware schedule and

templates provided by hardware supplier. Secure reinforcement by spot welding. Comply with applicable requirements of ANSI A115 Series specifications for door and frame preparation for hardware. Factory reinforce doors and frames to receive surface-applied hardware. Factory drill and tap for surface-applied hardware, except at pushplates and kickplates provide reinforcing only.

1. Locate hardware as indicated on the drawings or in Division 8 Section ‘Door Hardware’ or, if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."

2.8 METALLIC-COATED STEEL FINISHES

A. General: Clean, treat and prime surfaces of fabricated steel door and frame work, inside and out, whether exposed or concealed in the construction.

B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A 780.

1. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after surface preparation and pretreatment. Apply a sufficient number of coats, baked on, to obtain uniformly smooth exposed surfaces. Touch up surfaces having runs, smears, or bare spots.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, primer complying with ANSI A250.10 acceptance criteria; recommended by primer manufacturer for zinc-coated steel; compatible with substrate and field-applied finish paint system indicated.

2.9 STEEL SHEET FINISHES

A. General: Clean, treat and prime surfaces of fabricated steel door and frame work, inside and out, whether exposed or concealed in the construction.

B. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning"; remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale, shavings, filings, and rust, if present, complying with SSPC-SP 3, "Power Tool Cleaning,"

C. Factory Priming for Field-Painted Finish: Apply shop primer immediately after surface preparation and pretreatment. Apply a sufficient number of coats, baked on, to obtain uniformly smooth exposed surfaces. Touch up surfaces having runs, smears, or bare spots.

1. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, corrosion-inhibiting, lead- and chromate-free, universal primer complying with ANSI A250.10 acceptance criteria; compatible with substrate and field-applied finish paint system indicated.

2.10 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish. Grind and polish surfaces to produce uniform, texture, graining and reflectivity matching Architect's sample.

1. Bright, Directional Polish: NAAMM No. 4 finish.

2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install doors and frames according to DHI A115.IG, the Architect reviewed shop drawings, and manufacturer's written recommendations and installation instructions.

B. Frames: Install frames where indicated. Extend frame anchorages below fills and finishes. Coordinate the installation of built-in anchors for wall and partition construction as required with other work.

1. Welded Frames:

a. Set masonry anchorage devices where required for securing frames to in-place concrete or masonry construction.

1) Set anchorage devices opposite each anchor location as specified and anchorage device manufacturer's written instructions. Leave drilled holes rough, not reamed, and free of dust and debris.

b. Placing Frames: Set frames accurately in position; plumb; align, and brace securely until permanent anchors are set. After wall construction is complete, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.

1) At concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage devices. Anchor bottom of frames to floors with anchor bolts or power driven fasteners.
2) Field splice only at approved locations indicated on the shop drawings. Weld, grind, and finish as required to conceal evidence of splicing on exposed faces.
3) Remove spreader bars only after frames are properly set and secured.

2. At fire-rated openings, install frames according to NFPA 80.

C. Doors:

1. Non-Fire Rated Doors: Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

a. Jambs and Head: 3/32 inch (2 mm).

b. Meeting Edges, Pairs of Doors: 1/8 inch (3 mm).
c. Bottom: 3/8 inch (9 mm), if no threshold or carpet.
d. Bottom: 1/8 inch (3 mm), at threshold or carpet.

2. Fire-Rated Doors: Install with clearances as specified in NFPA 80.
3. Smoke Control Doors: Install according to NFPA 105.

D. Apply hardware in accordance with hardware manufacturer's instructions and Division 8 Section 'Door Hardware'. Drill and tap for machine screws as required. Do not use self tapping sheet metal screws. Adjust door installation to provide uniform clearance at head and jambs, and to contact stops uniformly. Adjust hardware items just prior to final inspection. Leave work in complete and proper operating condition.

3.2 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items just before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise unacceptable.

B. Prime-Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

1. Finish Painting: Refer to Division 9 Section "Painting".

C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish and clean to match undamaged finish.

D. Remove and replace defective work, including doors or frames that are warped, bowed, or otherwise defective.

E. Institute protective measures required throughout the remainder of the construction period to ensure that steel doors and frames will be without any damage or deterioration, at time of substantial completion.

END OF SECTION 08 11 00

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes access doors and frames.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of access door and frame indicated. Include construction details relative to materials, individual components and profiles, finishes, and fire ratings for access doors and frames.

B. Schedule: Provide complete door and frame schedule, including types, general locations, sizes, construction details, latching or locking provisions, and other data pertinent to installation.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:

1. Method of attaching door frames to surrounding construction.
2. Ceiling-mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim.

D. Submittals for LEED-NC:

3. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
4. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
5. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.
    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.3 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain access doors for entire project from one source from a single manufacturer.

B. Fire-Rated Access Doors and Frames: Provide access doors and frames complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are labeled and listed by UL:

1. UL 10B for vertical access doors.

C. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units, which may vary slightly from sizes indicated.

1.4 COORDINATION

A. Verification: Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment, and where shown on the drawings, and indicate on schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES

A. Flush, Insulated, Fire-Rated Access Doors and Trimless Frames: Fabricated from steel sheet.

1. Locations: Gypsum board wall surfaces and where indicated as a "Man Access Door".
2. Fire-Resistance Rating: One and one-half hours.
3. Temperature Rise Rating: 250 deg F (139 deg C) at the end of 30 minutes.
4. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal.
5. Frame: Sheet metal with drywall bead.
6. Hinges: Continuous piano hinge.
7. Automatic Closer: Spring type.
8. Latch: Self-latching bolt operated by flush key with interior release.
9. Products: One of the following:

    a. Larsen's Industries, Inc.; L-FRAP.
    b. Milcor; Style UFR.
    c. Nystrom, Inc.; IW Series.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Ceramic-tile wall surfaces.
2. Door: Minimum 14 ga. thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 16 ga. thick sheet metal with 1-inch- (25-mm-) wide, surface-mounted trim.
4. Hinges: Continuous piano hinge.
5. Latch: Flush, key- operated cam latch of number required to hold door in flush, smooth plane when closed.
6. Products: One of the following:

    a. Larsen's Industries, Inc.; Model L-MPG.
    b. Milcor; Style M.

c. Nystrom, Inc.; NT Series.

C. Flush Access Typical Doors and Trimless Frames for Vertical Surfaces: Fabricated from steel sheet.

1. Locations: Gypsum board wall surfaces.
2. Door: Minimum 14 ga. thick sheet metal, set flush with surrounding finish surfaces.
3. Frame: Minimum 16 ga. thick sheet metal with drywall bead.
4. Hinges: Continuous concealed type.
5. Latch: Flush, key- operated cam latch of number required to hold door in flush, smooth plane when closed.
6. Products: One of the following:

a. Larsen's Industries, Inc.; Model L-DWC.
b. Milcor; Style DW.
c. Nystrom, Inc.; NW Series.

D. Flush Access Typical Doors and Trimless Frames for Horizontal Surfaces: Fabricated from glass fiber reinforced gypsum.

1. Locations: Gypsum board ceiling surfaces.
2. Door: Minimum 1/8" thick glass fiber reinforced gypsum, set flush with surrounding gypsum wallboard finish surfaces.
3. Frame: Minimum 1/8" thick glass fiber reinforced gypsum, with tapered square edge.
4. Hinges and Latch: None, lay-in manual push up type.
5. Product:

a. Chicago Metallic Ceiling Systems and Specialty Products: Glass Reinforced Gypsum Drywall Ceiling Access Doors.
b. Formglas, Inc.: Interior Ceiling Access Panel.

E. Flush Access Doors with Exposed Frames for Horizontal Acoustically Rated Surfaces: Fabricated from steel sheet.

1. Locations: Gypsum board ceiling surfaces.
2. Fire-Resistance Rating: Warnock Hersey Listed for 3 hour non-combustable floor ceiling assembly rating.
3. Door: Flush panel with a core of mineral-fiber insulation enclosed in sheet metal.
4. Frame: Sheet metal with drywall bead.
5. Hinges: Continuous piano hinge.
6. Automatic Closer: Extension type closure spring.
7. Latch: Universal mechanism with self-latching bolt.
8. Product: Pottorff div. of PCI Industries: Model FD Fire Rated Access Panels.

2.2 FABRICATION

A. General: Provide access door assemblies manufactured as integral units ready for installation.

B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction. Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Provide special sized access doors where required or requested.

C. Frames:

1. Exposed Flanges: Nominal 1 to 1-1/2 inches (25 to 38 mm) wide around perimeter of frame.
2. Provide trimless carbon steel frames with drywall bead for installation in gypsum wallboard assembly, furnish perforated frames with drywall bead, securely attached to perimeter of frames, in size to suit thickness of gypsum panels indicated.
3. Provide mounting holes in frames to attach frames to metal framing in drywall construction.

2.3 CARBON STEEL FINISHES

A. Surface Preparation: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."

B. Apply shop primer to uncoated surfaces of metal fabrications. Comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions for installation of access doors. Coordinate installation with work of other trades.

B. Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

C. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces. Install access doors flush with adjacent finish surfaces.

D. Adjust doors and hardware after installation for proper operation.

E. Remove and replace panels or frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 33 23 – OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following types of overhead coiling doors:

1. Service doors.
2. Fire-rated shutters

1.2 PERFORMANCE REQUIREMENTS

A. Operational Life: Design components to operate for not less than 20,000 cycles.

1. Operation Cycle: One complete cycle begins with door in closed position. Door is then moved to open position and back to closed position.
2. Include tamperproof cycle counter.

1.3 SUBMITTALS

A. Product Data: Submit product data for each product indicated.

B. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1 and MR 5.2: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

C. Shop Drawings: Submit shop drawings including plans, elevations, sections, details of installation, wiring diagrams, and attachments to other Work.

1. Verify openings by field measurements before fabrication and indicate measurements on Shop Drawings.

D. Samples: Submit samples for each exposed finish.

E. Oversize Fire-Rated Construction Certification: Submit certifications for fire rated assemblies exceeding size limits of labeled assemblies, by testing agency acceptable to authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Fire-Rated Door Assemblies: Complying with NFPA 80, identical to assemblies tested per UL 10b, and labeled and listed for fire ratings indicated by UL, FM, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.

B. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a testing agency acceptable to authorities having jurisdiction that doors comply with construction requirements of tested and labeled fire-rated door assemblies, except for size.

C. 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.

PART 2 - PRODUCTS

2.1 Exterior Tug (Door Type M) Basis of Design Product: Albany Door Systems UltraSecure 3000 high speed door. See drawings for dimensions. Note that selected doors may exceed standard maximum door widths. Manufacturer shall custom engineer and warranty door for dimensions shown on drawings.

2.2 Interior Fire Shutter (Door Type F) Basis of Design Product: McKeon FSFD Auto-Set fire door, 3 hour fire rating. Activation and programming shall be coordinated with Division 26 ELECTRICAL and Section 28 31 00 FIRE ALARM SYSTEM.

2.3 DOOR CURTAIN AND CONSTRUCTION

A. Door Curtain: Interlocking slats in continuous length for width of door. Unless otherwise indicated, slats of material thickness recommended by door manufacturer for performance, size, and type of door indicated.

a. Inside Curtain Slat Face: Match material of outside metal curtain slat.

B. Endlocks, General: Locate locks on every other curtain slat for curtain alignment and resistance against lateral movement.

1. Service Door Endlocks: Malleable-iron castings galvanized after fabrication, and secured to curtain slats with galvanized rivets, or high-strength nylon.

C. Bottom Bar: Continuous channel or tubular shape, in material matching curtain slats.

1. Astragal: Replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene, that is cushion bumper for interior door.
2. Motor-Operated Doors: With combination bottom astragal and sensor edge.

D. Curtain Jamb Guides: Steel angles, or channels and angles, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading.
1. Service Doors: Build up units with not less than 3/16-inch- (5-mm-) thick, galvanized steel sections complying with ASTM A 36/A 36M, and ASTM A 123. Slot bolt holes for guide adjustment. Prevent overtravel of curtain with removable stops on guides and hold windlocks with continuous bar.

2.4 HOODS AND ACCESSORIES

A. Hood: Form to enclose coiled curtain and operating mechanism at opening head and act as weatherseal. Contour to suit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Provide closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting projecting beyond wall face. Provide intermediate support brackets as required to prevent sag.

B. Integral Sills: Fabricate sills as integral part of frame assembly of same sheet metal, but not less than 0.078 inch (2.0 mm) thick.

C. Smoke Seals: UL-listed and -tested, smoke-seal perimeter gaskets.

D. Windows: 1/4-inch (6-mm) clear, transparent acrylic sheet. Set glazing in vinyl, rubber or neoprene glazing channel secured to curtain slats.

E. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.

1. Provide pull-down straps or pole hooks for doors more than 84 inches (2130 mm) high.

F. Slide Bolt: Fabricate with side locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

G. Chain Lock Keeper: Suitable for padlock.

H. Power-Operated Doors: With safety interlock switch to disengage power supply when door is locked.

I. Fire-Rated Assemblies: With automatic-closing device inoperative during normal door operations, with governor unit complying with requirements in NFPA 80, with easily tested and reset release mechanism, and designed to be activated by the following:
1. Temperature rise and melting point of 165 deg F (74 deg C) replaceable fusible links, interconnected and on both sides of wall of door opening.
2. UL-labeled smoke detector and door-holder-release devices.
3. UL-labeled heat detector and door-holder-release devices.
4. Building fire alarm and detection system and door-holder-release devices.

J. Counterbalancing Mechanism: Adjustable, oil-tempered, heat-treated steel helical torsion springs mounted around structural carbon-steel pipe, and contained in barrel of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. (2.5 mm/m) of span under full load; with grease-sealed bearings or self-lubricating graphite bearings.

1. Mounting Brackets: Cast-iron or cold-rolled steel plate with bell-mouth guide groove for curtain.

K. Electric Door Operator: Type, size, and capacity recommended and provided by door manufacturer for door and operational life specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, disconnect device, emergency auxiliary operator, and accessories required for proper operation.

1. Comply with NFPA 70. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.
2. Electric Motors: Polyphase, medium-induction type with high-starting torque, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1; with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) or more than 1 fps (0.3 m/s), without exceeding nameplate ratings or considering service factor. Coordinate wiring requirements and electric characteristics of motors with building electrical system.

a. Provide open dripproof-type motor, and controller with NEMA ICS 6, Type 1 enclosure.

3. Control Equipment: NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V ac or dc. Provide momentary-contact, three-button control station.

a. Interior Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

4. Obstruction Detection Device: Provide each motorized door with self-monitoring, four-wire-configured-type, electrically actuated, external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward door travel.
5. Adjustable Limit Switches: Interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

2.5 FINISHES

A. Steel Finish: Manufacturer's standard powder coating.

1. Color and Gloss: As selected from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install door and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports.

1. Fire-Rated Doors: Install to comply with NFPA 80.

B. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion for entire perimeter.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain doors. Refer to Division 01 Section "Closeout Procedures Demonstration and Training."

END OF SECTION 08 33 23
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SECTION 08 36 13 - SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes electrically operated sectional doors.

B. Related Section:

1. Division 05 Section "Metal Fabrications" for miscellaneous steel supports.

1.2 PERFORMANCE REQUIREMENTS

A. General Performance: Sectional doors shall meet performance requirements specified without failure due to defective manufacture, fabrication, installation, or other defects in construction and without requiring temporary installation of reinforcing components.

B. Delegated Design: Design sectional doors, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Performance: Exterior sectional doors shall withstand the effects of gravity loads, and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Wind Loads: Uniform pressure (velocity pressure) of 20 lbf/sq. ft. (960 Pa), acting inward and outward.

D. Air Infiltration: Maximum rate not more than indicated when tested according to ASTM E 283.

1. Air Infiltration: Maximum rate of 0.08 cfm/sq. ft. (0.406 L/s per sq. m) at 15 and 25 mph (24.1 and 40.2 km/h).

E. Seismic Performance: Sectional doors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.3 SUBMITTALS

A. Product Data: For each type and size of sectional door and accessory.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Delegated-Design Submittal: For sectional doors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Seismic Qualification Certificates: For sectional doors**,** accessories, and components, from manufacturer.

F. Maintenance data.

G. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.

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. Standard for Sectional Doors: Fabricate sectional doors to comply with DASMA 102 unless otherwise indicated.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sectional doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 STEEL DOOR SECTIONS

A. Exterior Section Faces and Frames: Fabricate from manufacturer's standard zinc-coated (galvanized), cold-rolled, steel sheet.

1. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.
2. For insulated doors, provide sections with continuous thermal-break construction, separating the exterior and interior faces of door.

B. Section Ends and Intermediate Stiles: Enclose open ends of sections with channel end stiles formed from galvanized-steel sheet welded to door section. Provide intermediate stiles formed from galvanized-steel sheet, cut to door section profile, and welded in place. Space stiles not more than 48 inches (1219 mm) apart.

C. Reinforce bottom section with a continuous channel or angle conforming to bottom-section profile and allowing installation of astragal.

D. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized-steel bars, struts, trusses, or strip steel, formed to depth and bolted or welded in place.

E. Provide reinforcement for hardware attachment.

F. Thermal Insulation: Insulate interior of steel sections with door manufacturer's standard CFC-free insulation, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E 84. Enclose insulation completely within steel sections that incorporate the following interior facing material, with no exposed insulation:

2.2 TRACKS, SUPPORTS, AND ACCESSORIES

A. Tracks: Manufacturer's standard, galvanized-steel track system of configuration indicated, sized for door size and weight, designed for lift type indicated and clearances shown on Drawings. Provide complete track assembly including brackets, bracing, and reinforcement for rigid support of ball-bearing roller guides for required door type and size. Slot vertical sections of track spaced 2 inches (51 mm) apart for door-drop safety device. Slope tracks at proper angle from vertical or design tracks to ensure tight closure at jambs when door unit is closed.

B. Track Reinforcement and Supports: Galvanized-steel track reinforcement and support members. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

C. Weatherseals: Replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and top of sectional door unless otherwise indicated.

2.3 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Heavy-duty, galvanized-steel hinges at each end stile and at each intermediate stile, according to manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails.

C. Rollers: Heavy-duty rollers with steel ball-bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Provide 3-inch- (76-mm-) diameter roller tires for 3-inch- (76-mm-) wide track and 2-inch- (51-mm-) diameter roller tires for 2-inch- (51-mm-) wide track.

D. Push/Pull Handles: For push-up or emergency-operated doors, provide galvanized-steel lifting handles on each side of door.

2.4 LOCKING DEVICES

A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on single-jamb side, operable from inside only.

B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded deadbolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders standard with manufacturer and keyed to building keying system.
2. Keys: Three for each cylinder.

C. Chain Lock Keeper: Suitable for padlock.

D. Safety Interlock Switch: Equip power-operated doors with safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCE MECHANISM

A. Torsion Spring: Counterbalance mechanism consisting of adjustable-tension torsion springs mounted on torsion shaft made of steel tube or solid steel. Provide springs designed for number of operation cycles indicated.

B. Cable Drums and Shaft for Doors: Cast-aluminum or gray-iron casting cable drums mounted on torsion shaft and grooved to receive door-lifting cables as door is raised. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of torsion shaft.

C. Cables: Galvanized-steel lifting cables.

D. Cable Safety Device: Include, on each side-edge of door, a device designed to automatically stop door if either lifting cable breaks.

E. Bracket: Provide anchor support bracket as required to connect stationary end of spring to the wall and to level the shaft and prevent sag.

F. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

1. Comply with NFPA 70.

2. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6; with NFPA 70, Class 2 control circuit, maximum 24-V ac or dc.

B. Usage Classification: Electric operator and components capable of operating for not less than number of cycles per hour indicated for each door.

C. Door-Operator Type: Unit of type indicated, consisting of electric motor, gears, pulleys, belts, sprockets, chains, and controls needed to operate door and meet required usage classification.

D. Electric Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements specified in Division 11 Section "Common Motor Requirements for Equipment" unless otherwise indicated.

1. Motor Type and Controller: Reversible motor and controller (disconnect switch) for motor exposure indicated.
2. Motor Size: Minimum size as indicated. If not indicated, large enough to start, accelerate, and operate door in either direction from any position, at a speed not less than 8 in./sec. (203 mm/s) and not more than 12 in./sec. (305 mm/s), without exceeding nameplate ratings or service factor.
3. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.

E. Obstruction Detection Device: Equip motorized door with indicated external automatic safety sensor capable of protecting full width of door opening. Activation of device immediately stops and reverses downward door travel.

1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction. Provide self-monitoring capability designed to interface with door-operator control circuit to detect damage to or disconnection of sensor device.

F. Remote-Control Station: Momentary-contact, three-button control station with push-button controls labeled "Open," "Close," and "Stop."

1. Interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
2. Exterior units, full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.

G. Emergency Manual Operation: Equip each electrically powered door with capability for emergency manual operation. Design manual mechanism so required force for door operation does not exceed 25 lbf (111 N).

H. Emergency Operation Disconnect Device: Equip operator with hand-operated disconnect mechanism for automatically engaging manual operator and releasing brake for emergency manual operation while disconnecting motor without affecting timing of limit switch. Mount mechanism so it is accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

I. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.

J. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with regulatory requirements for accessibility.

2.7 DOOR ASSEMBLY (Door Type N-Loading Dock)

A. Steel Sectional Door: Insulated sectional door formed with hinged sections.
1. Basis-of-Design Product: Subject to compliance with requirements, provide Clopay Building Products Model 3722 or comparable product by one of the following:

a. Amarr Garage Doors.
b. Arm-R-Lite.
c. C.H.I. Overhead Doors.
d. Fimbel Architectural Door Specialties.
e. General American Door Company.
f. Haas Door; a Nofziger company.
g. Martin Door Manufacturing.
h. Overhead Door Corporation.
i. Raynor.
j. Rite-Hite Corporation.
k. Wayne-Dalton Corp.
l. Windsor Republic Doors.

B. Installed R-Value: 17.2

C. Steel Sections: Zinc-coated (galvanized) steel sheet, formed into sections 2 inches (51 mm) thick.

1. Exterior-Face Surface: 20 gauge min flush steel face sheet
2. Interior Facing Material: 27 gauge min flush steel face sheet

D. Track Configuration: Vertical-lift track.

E. Weatherseals: Fitted to bottom and top and around entire perimeter of door.

F. Locking Devices: Equip door with locking device assembly and chain lock keeper.

G. Electric Door Operator:

1. Usage Classification: Heavy duty, 60 to 90 cycles per hour.
2. Motor Exposure: Exterior, dusty, wet, or humid.
3. Emergency Manual Operation: Chain type.
4. Obstruction-Detection Device: Automatic photoelectric sensor.
5. Other Equipment: Audible and visual signals.

H. Door Finish:

1. Prefinished interior and exterior skins with 1-mil , three coat baked-on polyester topcoat over primer on a phosphate coating.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install sectional doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Tracks: Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment. Repair galvanized coating on tracks according to ASTM A 780.

C. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Adjust doors and seals to provide weathertight fit around entire perimeter.

3.2 DEMONSTRATION

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

END OF SECTION 08 36 13

SECTION 08 41 13 – ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes aluminum entrances and storefronts.

1. Security system components will be incorporated into portions of the aluminum entrances and storefronts work. Cooperate with the security system contractors to incorporate security system components during the course of the Work.

B. Single Subcontract Responsibilities: Refer to Division 8 Section "Glazed Aluminum Curtain Walls" for the requirements of single subcontract responsibilities for aluminum entrances and storefronts.

1.2 PERFORMANCE REQUIREMENTS

A. General: Refer to Division 8 Section "Glazed Aluminum Curtain Walls" for performance requirements, fabrication and erection standards; in addition provide the following:

1. Design and fabricate aluminum entrances to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Design Modifications:

1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each aluminum entrance and storefront product specified.

B. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the aluminum entrance and storefront work. Full scale sections shall be prepared and submitted for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of all metal components, glass thicknesses, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance

with the Contract Documents. Details of field connections, anchorage, and their relationship to the work of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation. No work shall be fabricated until shop drawings for that work have been approved by Architect for fabrication.

C. Samples: Submit samples of the following before any work is fabricated:

1. 3 paired sets of samples for each exposed metal finish required. Sample finishes shall be on the specified alloy, temper, and thickness of metal required for the work. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish samples in either 12-inch- (300-mm-) lengths of rails or 12-inch- (300-mm-) squares of sheet.

D. Submittals for LEED-NC:
1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.
   a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
   b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Award the fabrication of aluminum entrance and storefront door and frame components to a single firm specializing in the fabrication of aluminum entrance and storefront components who has successfully produced work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years. The fabricator shall have sufficient production capacity, have organized quality control and testing procedures, and published written and illustrated installation manuals, to produce and properly install the entrance assemblies required without causing delay in progress of the Work.

B. Installer Qualifications: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

1.5 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the entrance and storefront work will be accurately designed, fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating entrance and storefront work without field measurements. Coordinate supporting structure construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. General: Refer to Division 8 Section "Glazed Aluminum Curtain Walls".

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Refer to Division 8 Section "Glazed Aluminum Curtain Walls".

B. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold-rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

C. Glass and Glazing Materials: As specified in Division 8 Section "Glazing."

D. Anchors and Fasteners:

1. Material: Stainless steel.
2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self-drilling, self-tapping type fasteners.
3. Do not use exposed anchors and fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.
4. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

E. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:

1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

F. Door Hardware: Refer to Division 8 Section "Door Hardware."

2.2 SEALING MATERIALS

A. Concealed Sealing Materials: All sealing materials concealed within the entrances and storefronts shall be silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Materials: All sealing materials exposed at entrance and storefront perimeter joints in contact with adjacent cladding materials are specified in Division 7 Section "Joint Sealants".

2.3 FABRICATION

A. General: Fabricate the entrances and storefronts to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies which meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.

1. Metal Wall Thickness: Provide shapes as shown and as required to suit the performance requirements but with wall thickness of not less than 1/8 inch (3 mm).
2. Door Stile and Rail Dimensions:

    a. Bottomrails: Provide minimum 10-inch (254-mm) high one piece bottomrail unless otherwise indicated on the drawings.
    b. Stiles Rail Dimensions: Wide stile; over 4 inches (101.6 mm) wide, unless otherwise indicated.
    c. Top Rail Dimensions: 6 inches (101.6 mm) wide, unless otherwise indicated.
    d. Door Thickness: 1-3/4-inch (44.5 mm).
    e. Preglaze door units to greatest extent possible, in coordination with installation and hardware requirements. Glazing, whether in factory or in field, shall be performed in accordance with Division 8 Section 'Glazing'.
    f. Fabricate all doors and frames to accommodate the swing direction shown.

3. Provide extruded aluminum entrance door inserts at door frames designed with bosses sized to receive selected door gasket.

B. Provide continuous interior glazing stops with concealed fasteners for all doors and frames. Provide stops with hairline joints at corners. Provide stops with square, not beveled, shouldered profile unless otherwise shown.

C. Doors and frames shall be cut, reinforced, drilled and tapped in strict accordance with the printed door hardware manufacturers templates and instructions. Provide solid stainless steel or bronze hardware reinforcements, securely fastened to doors and frames where door hardware is to be attached.

1. Security system components will be incorporated into the entrance door and frame work. Provide all cutouts required by the security system vendor and all prewiring for vendor provided security system devices. Wherever storefront and entrance framing components are to receive wiring provide unobstructed clear paths free of burrs and sharp objects with pull strings to facilitate wiring.

D. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and

rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce entrance components with aluminum or carbon steel shapes, bars, and plates.

E. Shop Assembly: As far as practible, all fitting and assembly work shall be done in a fabrication shop.

1. For exterior entrances, provide weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior. Provide weep baffles secured to inside of frame behind weepholes.

F. Exposed Fasteners: Not permitted.

G. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

2.4 ALUMINUM FINISHES

A. General: As specified in Division 8 Section ‘Glazed Aluminum Curtain Walls’.

2.5 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.
2. Coating for Aluminum, and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

SECTION 08 42 29 - AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior and interior, sliding, power-operated automatic entrances.

1.2 PERFORMANCE REQUIREMENTS

A. Opening-Force Requirements:

1. Power-Operated Doors: Not more than 50 lbf (222 N) required to manually set door in motion if power fails, and not more than 15 lbf (67 N) required to open door to minimum required width.
2. Breakaway Device for Power-Operated Doors: Not more than 50 lbf (222 N) required for a breakaway door or panel to open.

B. Entrapment Force Requirements:

1. Power-Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.

1.3 SUBMITTALS

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

B. Shop Drawings: For automatic entrances. Include plans, elevations, sections, details, hardware mounting heights, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.
2. Activation and safety devices.
3. Include hardware schedule and indicate hardware types, functions, quantities, and locations.

C. Sample: For each exposed product and for each color and texture specified.

D. Product certificates.

E. Product test reports.

F. Field quality-control reports.

G. Maintenance data.

H. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation and maintenance of units required for this Project and who employs a certified inspector.

B. Certified Inspector Qualifications: Certified by AAADM.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Power-Operated Door Standard: BHMA A156.10.

E. Emergency-Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrances serving as a required means of egress.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of automatic entrances that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
2. Sheet and Plate: ASTM B 209 (ASTM B 209M).

B. Steel Reinforcement: With manufacturer's standard corrosion-resistant primer complying with SSPC-PS Guide No. 12.00 applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

C. Stainless-Steel Bars: ASTM A 276 or ASTM A 666, Type 304.

D. Stainless-Steel Tubing: ASTM A 554, Grade MT 304.

E. Glazing: As specified in Division 08 Section "Glazing."

F. Sealants and Joint Fillers: As specified in Division 07 Section "Joint Sealants."

G. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107; of consistency suitable for application.

H. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos; formulated for 30-mil (0.76-mm) thickness per coat.

I. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.2 SLIDING AUTOMATIC ENTRANCES

A. General: Provide manufacturer's standard automatic entrances including doors, sidelites, framing, headers, carrier assemblies, roller tracks, door operators, activation and safety devices, and accessories required for a complete installation.

B. Sliding Automatic Entrance:

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. Single- and Biparting-Sliding Units:

        1) Besam Automated Entrance Systems, Inc.; an ASSA ABLOY Group company.
        2) DORMA Automatics; Div. of DORMA Group North America.
        3) Gildor, Inc.
        4) Horton Automatics; Div. of Overhead Door Corporation.
        5) KM Systems, Inc.
        6) Nabco Entrances Inc.
        7) Sierra Automatic Doors, Inc.
        8) Stanley Access Technologies; Div. of The Stanley Works.
        9) Tormax Technologies, Inc.

2. Configuration:
    a. Emergency Breakaway Capability: Sliding leaf(leaves) only.
    b. Mounting: Surface.

3. Operator Features:

    a. Power opening and closing.
    b. Drive System: Chain or belt.
    c. Adjustable opening and closing speeds.
    d. Adjustable hold-open time between 0 and 30 seconds.
    e. Obstruction recycle.
    f. On-off/hold-open switch to control electric power to operator.

4. Sliding Door Carrier Assemblies and Overhead Roller Tracks: Manufacturer's standard carrier assembly that allows vertical adjustment; consisting of nylon- or delrin-covered, ball-bearing-center steel wheels operating on a continuous roller track, or ball-bearing-center steel wheels operating on a nylon- or delrin-covered, continuous roller track. Support doors from carrier assembly by cantilever and pivot assembly.

    a. Rollers: Minimum of two ball-bearing roller wheels and two antirise rollers for each active leaf.

5. Sliding Door Threshold: Manufacturer's standard threshold members and bottom-guide track system, with stainless-steel, ball-bearing-center roller wheels.

    a. Configuration: No threshold across door opening

6. Combination Activation and Safety Device: Combination motion/presence sensor.

7. Activation Device: Motion sensors mounted on door header to detect pedestrians in activating zone to activate door operator.
8. Safety Devices: Presence sensor mounted on each side of door header and one photoelectric beam mounted in sidelite jambs to detect pedestrians in presence zone and to prevent door from closing.
9. Sidelite Safety Device: Presence sensor, mounted above each sidelite on side of door opening through which doors travel, to detect obstructions and to prevent door from opening.
10. Finish: Finish framing, door(s) and header with high-performance organic finish (three-coat fluoropolymer).

    a. Color: As selected by Architect from full range of industry colors and color densities.

2.3 ENTRANCE COMPONENTS

A. Framing and Transom Members: Manufacturer's standard extruded aluminum, minimum 0.125 inch (3.2 mm) thick and reinforced as required to support imposed loads.

1. Nominal Size: 1-3/4 by 4-1/2 inches (45 by 115 mm).
2. Extruded Glazing Stops and Applied Trim: Minimum 0.062-inch (1.6-mm) wall thickness.

B. Stile and Rail Doors: Manufacturer's standard 1-3/4-inch- (45-mm-) thick, glazed doors with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members. Mechanically fasten corners with reinforcing brackets that are welded, or incorporate concealed tie-rods that span full length of top and bottom rails.

1. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and manufacturer's standard preformed gaskets.
2. Stile Design: Medium stile, 3-1/2-inch (90-mm) nominal width.
3. Rail Design: 5-inch (125-mm) nominal height.
4. Muntin Bars: Horizontal tubular rail member for each door; match stile design and finish.

C. Sidelite(s) and Transom: Manufacturer's standard 1-3/4-inch- (45-mm-) deep sidelite(s) and transom with minimum 0.125-inch- (3.2-mm-) thick, extruded-aluminum tubular stile and rail members matching door design and finish.

1. Glazing Stops and Gaskets: Same materials and design as for stile and rail door.
2. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and manufacturer's standard preformed gaskets.
3. Muntin Bars: Horizontal tubular rail members for each sidelite; match stile design.

D. Headers: Fabricated from minimum 0.125-inch- (3.2-mm-) thick, extruded aluminum and extending full width of automatic entrance units to conceal door operators and controls. Provide hinged or removable access panels for service and adjustment of door operators and controls. Secure panels to prevent unauthorized access.

1. Mounting: Concealed, with one side of header flush with framing.
2. Capacity: Capable of supporting doors up to 175 lb (79 kg) per leaf over spans up to 14 feet (4.3 m) without intermediate supports.

a. Provide sag rods for spans exceeding 14 feet (4.3 m).

E. Signage: Affixed to both sides of each door as required by BHMA A156.10 and BHMA A156.19 for type of door and its operation.

1. Application Process: Door manufacturer's standard process.

2.4 DOOR OPERATORS AND ACTIVATION AND SAFETY DEVICES

A. Door Operators: Provide door operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated.

1. Door Operator Performance: Provide door operators that will open and close doors and maintain them in fully closed position when subjected to Project's design wind loads.
2. Electromechanical Operators: Concealed, self-contained, overhead unit powered by fractional-horsepower, permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor; with solid-state microprocessor controller; UL 325; and with manual operation with power off.

B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units with metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10; with relay hold time of not less than 2 to 10 seconds.

1. Provide capability for switching between bidirectional and unidirectional detection.
2. For one-way-traffic entrances, sensor on egress side shall not be active when doors are fully closed.

C. Combination Motion/Presence Sensors: Self-contained units; consisting of both motion and presence sensors in a single metal or plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.

1. Motion Sensor: K-band-frequency, microwave-scanner units; with relay hold time of not less than 2 to 10 seconds.

a. Provide capability for switching between bidirectional and unidirectional detection.
b. For one-way-traffic entrances, sensor on egress side shall not be active when doors are fully closed.

2. Presence Sensor: Infrared-scanner units; with relay hold time of not less than 2 to 10 seconds. Sensors shall remain active at all times.

D. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.

E. Electrical Interlocks: Unless units are equipped with self-protecting devices or circuits, provide electrical interlocks to prevent activation of operator when door is locked, latched, or bolted.

2.5 HARDWARE

A. General: Provide units in sizes and types recommended by automatic entrance and hardware manufacturers for entrances and uses indicated. Finish exposed parts to match door finish unless otherwise indicated.

B. Breakaway Device for Power-Operated Doors: Provide breakaway device that allows door to swing out in direction of egress to full 90 degrees from any operating position. Maximum force to open door shall be 50 lbf (222 N) according to BHMA A156.10. Interrupt powered operation of door operator while in breakaway mode.

C. Hinges:
1. Butt Hinges: BHMA A156.1, Grade 1, 5-knuckle, 4-1/2-by-4-inch (114-by-102-mm) ball-bearing butts.

a. Provide nonremovable pins at hinges exposed on outside of door.
b. Provide nonferrous hinges for doors exposed to weather.
c. Provide 3 hinges at each leaf for doors up to 36 inches (914 mm) wide and 80 inches (2032 mm) tall; provide 4 hinges at each leaf for taller doors.

D. Deadlocks: Manufacturer's standard deadbolt operated by exterior cylinder and interior thumb turn, with minimum 1-inch- (25-mm-) long throw bolt; BHMA A156.5, Grade 1.

1. Cylinders: BHMA A156.5, Grade 1, six-pin mortise type.

a. Keying: Integrate into building master key system.
2. Two-Point Locking for Sliding Doors: Mechanism in stile of active door leaf that automatically extends second lockbolt into [**overhead carrier assembly**] [**threshold**].

E. Push Bars: As selected by Architect from manufacturer's full range of full-door-width, single push bars.

F. Weather Stripping: Manufacturer's standard replaceable components.

1. Sliding Type: AAMA 701, made of wool, polypropylene, or nylon woven pile with nylon-fabric or aluminum-strip backing.
2. Compression Type: Made of ASTM D 2000, molded neoprene, or ASTM D 2287, molded PVC.
3. Weather Sweeps: Manufacturer's standard nylon brush sweep mounted to underside of door bottom.

G. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket.

2.6 ACCESSORIES

A. Guide Rails: Fabricated from anodized-aluminum bars or tubing, minimum 30 inches (762 mm) high; positioned and projecting from face of door jamb for distance as indicated, but not less than that required by BHMA A156.10 for type of door and direction of travel; with filler panel.

2.7 FABRICATION

A. General: Factory fabricate automatic entrance components to designs, sizes, and thicknesses indicated and to comply with indicated standards.

B. Framing: Provide automatic entrances as prefabricated assemblies. Complete fabrication, assembly, finishing, hardware application, and other work before shipment to Project site.

C. Doors: Factory fabricated and assembled in profiles indicated. Reinforce as required to support imposed loads and for installing hardware.

D. Door Operators: Factory fabricated and installed in headers, including adjusting and testing.

E. Glazing: Fabricate framing with minimum glazing edge clearances for thickness and type of glazing indicated, according to GANA's "Glazing Manual."

F. Hardware: Factory install hardware to greatest extent possible; remove only as required for final finishing operation and for delivery to and installation at Project site. Cut, drill, and tap for factory-installed hardware before applying finishes.

1. Provide sliding-type weather stripping, mortised into door, at perimeter of doors.

2. Provide compression-type weather stripping at fixed stops of exterior doors. At locations without fixed stops, provide sliding-type weather stripping retained in adjustable strip mortised into door edge.
3. Provide weather sweeps mounted to underside of door bottoms of exterior doors.
4. Provide finger guards at each pivoted entrance door that has clearance at hinge side greater than 1/4 inch (6 mm) and less than 3/4 inch (19 mm) with door in any position. Anchor guards to hinge-jamb frame.

G. Activation and Safety Devices:

1. General: Factory install devices in doors and headers as required by BHMA A156.10 for type of door and direction of travel.
2. Install photoelectric beams in vertical jambs of sidelites, with dimension above finished floor as follows:

   a. Top Beam: 48 inches (1219 mm).
   b. Bottom Beam: 24 inches (610 mm).

3. Install photoelectric beams in sides of guide rails, with dimension above finished floor not less than 24 inches (610 mm).

2.8 ALUMINUM FINISHES

A. High-Performance Organic Finish: 3-coat fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.9 FIRE RATED SLIDING ENTRANCE DOOR AT EXISTING PARKING GARAGE

A. Where shown on the drawings and/or designated on the door schedule, single, bi-paring, or tele-slide slide fire doors shall be the 4700 Series Composite Fire door as manufactured by Door Engineering & Manufacturing LLC or approved equal.

1. DOOR PANEL CONSTRUCTION

   (a) Door shall bear the appropriate Underwriters Laboratories and Factory Mutual label for 4, 3, 1 ½ or ¾ hour (please indicate the label needed) 250° temperature rise in 30 minute rated. Sizes larger than 12' x 12' shall receive an oversized label from Underwriters Laboratories and Factory Mutual but cannot have a temperature rise rating.

   (b) Door thickness: Doors shall have a nominal thickness of 1 ¾".

(c) Core: Structural core of mineral fiberboard bonded under pressure to both face sheets.

(d) Face Sheets: Steel sheet shall be no lighter than 18, 16 or 14 gauge (choose one) galvannealed A-60 steel.

(e) Interior Framing: Interior framing channel shall be no lighter than 14 gauge A-60 galvannealed steel.

(f) The flush pulls, 14 gauge armour edge, trail door interlock and bottom guide channel shall be factory welded to the panels.

(g) All exposed welds shall be ground smooth and filled. All exposed surfaces shall be cleaned thoroughly prior to receiving one (1) coat of rust inhibiting red epoxy prime paint. Primer shall be applied by spraying.

(h) Multiple Panels: Shall be field assembled using an "H" shaped splice column with no exposed fasteners to lock one (1) panel into the other to form a solid one piece unit.

2. HARDWARE

a) Fire door hardware shall conform to N.F.P.A. #80 and be as specified.

b) All hardware for the door shall have a galvanized or zinc plated finish. The hardware shall include box track, adjustable track brackets, adjustable wall brackets, jamb binders, 14 gauge frame interlocks, adjustable concealed stay rollers, 6" x 6" wall washers and wall bolts. The box track shall be no lighter than 14 gauge. Also included is one (1) pair of four-wheel ball bearing hangers.

c) Automatic Closing System: A counterweight, cable reel, or controlled speed cable reel (choose one) closing system connected to a triple fusible link through wall system.

d) Mounting Hardware: Shall include all necessary wall washers and through wall bolts with nuts and washers.

3. FACTORY FINISHING

a) Steel Surfaces: All exposed door surfaces will be thoroughly cleaned prior to receiving one (1) coat of manufacturers standard prime paint. Primer shall be manufacturers' standard Diamond Vogel fast dry red structural steel primer L/F R/I and shall be applied by spraying.

4. OPERATOR SYSTEM

a) Operator system shall be the "ECTI2008" variable speed drive (max. of 36" per second) as manufactured by Door Engineering & Manufacturing. The operator will consist of a timing belt drive system that is linked to the door with drive brackets. The drive head directly drives the belt and is coupled with a micro-processor system manager for complete control and versatility of the door. The controlled and system manager shall be housed in a separate NEMA #4 enclosure including a battery back-up system for power failure. The operator shall be U.L. listed.

b) Electrical: Electrical: Operator will accept 115VAC to 575VAC Single Phase or 3 Phase inputs.

c) Controls: The control package shall include an electric reverse edge, one photo eye and receiver, and one - three button station.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight.

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

B. Entrances: Install automatic entrances plumb and true in alignment with established lines and grades without warp or rack of framing members and doors. Anchor securely in place.

1. Install surface-mounted hardware using concealed fasteners to greatest extent possible.
2. Set headers, carrier assemblies, tracks, operating brackets, and guides level and true to location with anchorage for permanent support.
3. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within system to exterior.
4. Level recesses for recessed thresholds using nonshrink grout.
5. Provide thresholds at exterior doors and where indicated].

C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.

D. Access-Control Devices: Connect access-control devices to access-control system as specified in Division 28 Sections.

E. Activation and Safety Devices: Install and adjust devices to provide detection field and functions indicated.

F. Guide Rails: Install rails according to BHMA A156.10 including Appendix A and manufacturer's written instructions unless otherwise indicated.

G. Glazing: Install glazing as specified in Division 08 Section "Glazing."

H. Sealants: Comply with requirements specified in Division 07 Section "Joint Sealants" to provide weathertight installation.

1. Set thresholds, bottom-guide track system, framing members and flashings in full sealant bed.
2. Seal perimeter of framing members with sealant.

I. Signage: Apply signage on both sides of each door as required by referenced door standards.

J. Wiring within Automatic Entrance Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's written limitations on bending radii. Provide and use lacing bars and distribution spools.

K. Inspection: Engage Installer's certified inspector to test and inspect automatic entrances and prepare test and inspection reports.

1. Certified inspector shall test and inspect each automatic entrance to determine compliance of installed systems with applicable BHMA standards.
2. Field Quality-Control Report: Certified inspector shall submit report in writing to Architect and Contractor within 24 hours after inspection.
3. Work will be considered defective if it does not pass tests and inspections.

L. Adjusting: Adjust door operators, controls, and hardware for smooth and safe operation and for weathertight closure; comply with requirements in BHMA A156.10.

1. Readjust door operators and controls after repeated operation of completed installation equivalent to 3 days' use by normal traffic (100 to 300 cycles). Lubricate hardware, operating equipment, and other moving parts.

M. Demonstration: Engage a certified inspector to train Owner's maintenance personnel to adjust, operate, and maintain automatic entrances.

END OF SECTION 08 42 29

SECTION 08 42 33 - REVOLVING DOOR ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes revolving entrance doors.

1. Security system components will be incorporated into the revolving entrance doors. Cooperate with the security system contractors to incorporate security system components during the course of the Work.
2. Single Subcontract Responsibilities: Refer to Division 8 Section “Glazed Aluminum Curtain Walls” for the requirements of single subcontract responsibilities for revolving entrance doors.

1.2 PERFORMANCE REQUIREMENTS

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls” for performance requirements, fabrication and erection standards; in addition provide the following:

1. Design and fabricate revolving entrance doors to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Design Modifications:

1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's specifications and installation instructions for each revolving entrance door product specified.

B. Shop Drawings: Submit shop drawings showing scaled elevations, plans, and sections of the revolving entrance door work. Full scale sections shall be prepared and submitted for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of all metal components, glass thicknesses, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance with the Contract Documents. Details of field connections, anchorage, and their relationship to the work

of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation. No work shall be fabricated until shop drawings for that work have been approved by Architect for fabrication.

C. Samples: Submit samples of the following before any work is fabricated:

1. 3 paired sets of samples for each exposed metal finish required. Sample finishes shall be on the specified alloy, temper, and thickness of metal required for the work. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish samples in either 12-inch- (300-mm-) lengths of rails or 12-inch- (300-mm-) squares of sheet.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Means of Egress Requirements: Comply with requirements of authorities having jurisdiction for revolving entrance doors serving as a component of a means of egress, including capability of collapsing into a book-fold position, minimum exit width, maximum turning speed, and maximum force required to collapse door wings.

1.5 DELIVERY, STORAGE, AND HANDLING

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the revolving entrance door work will be accurately designed, fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor’s lines and benchmarks as a basis for measurements.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating revolving entrance doors without field measurements. Coordinate supporting structure construction to ensure that actual opening dimensions correspond to established dimensions.

1.7 WARRANTY

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

B. Concealed Components: All components required to join, reinforce or support revolving entrance door assemblies and located within jambs, head members, and mullions shall be fabricated from stainless steel. At all other locations provide carbon steel components to reinforce and support revolving entrance door assemblies conforming to ASTM A 36 (ASTM A 36M) for structural shapes, plates, and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-rolled sheet and strip.

C. Welding Electrodes and Filler Metal: Type and alloy as recommended by producer of metal to be welded, complying with applicable AWS specifications, and as required for color match, strength, and compatibility in fabricated items.

D. Anchors and Fasteners:

1. Material: Stainless steel.
2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self-drilling, self-tapping type fasteners.
3. Do not use exposed anchors and fasteners, except for hardware application. For hardware application, use countersunk Phillips flat-head machine screws finished to match framing members or hardware being fastened, unless otherwise indicated.

E. Weather Stripping: Provide heavy-duty, single-piece genuine horsehair weather stripping on all edges of door wings specifically designed to conform to the curved enclosure walls, ceiling and floor and which are specifically recommended by the revolving door manufacturer to comply with the performance requirements for air infiltration.

F. Nonshrink, Nonmetallic Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout; complying with ASTM C 1107; of consistency suitable for application.

2.2 SEALING MATERIALS

A. Concealed Sealing Systems: All sealing materials concealed within the revolving entrance door work shall be silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Systems: All sealing materials exposed at revolving entrance door perimeter joints in contact with adjacent cladding materials: Silicone, refer to Division 7 Section “Joint Sealants”.

2.3 COMPONENTS

A. Glazing Components:

1. Door Wings and Show Cases: 6 mm thick, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent glass, flat), clear glass.

2. Enclosure Walls: Curved with single-bend glass lites composed of 6 mm thick, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent glass, flat), clear glass.

B. Ceilings: Manufacturer's standard, complying with the following:

1. Metal: Fabricate from minimum 0.062-inch- (1.6-mm-) thick, formed metal sheet matching enclosure walls.

2. Ceiling Lights: Manufacturer's standard consisting of fourteen (14) recessed 5” diameter 50W Halogen light fixtures within the revolving entrance door enclosure ceiling, complete with lamps and translucent lenses.

C. Canopy: Manufacturer's standard, with size and layout matching diameter of enclosure walls and as indicated and with opaque panel sides of material and finish matching metal components of the enclosure walls, unless otherwise indicated.

1. Canopy Roof: Provide weathertight roof option for each door. Exposed portions of the roof to be manufactured from materials and finished to match enclosure walls.

D. Floors: Fabricate floors to receive recessed grille walk off mat flooring specified under Section 12 48 13, ENTRANCE FLOOR MATS AND FRAMES.

1. Frames and Supports: Fabricate recessed frame rings to receive recessed grille walk off mat flooring from stainless steel bar stock, with welded construction, to sizes, shapes, and profiles indicated and as necessary to support grilles.

2.4 REVOLVING DOOR ASSEMBLIES

A. General: Provide manufacturer's standard revolving entrance door assemblies, complete with door wings, enclosure walls, ceiling, hardware, glass, controls, activation devices, safety devices, and accessories as indicated. Provide manufacturers door component upgrades which are specifically designed to extend revolving entrance door assembly performance and facilitate low maintenance.

1. Basis of Design Product: Duotour 2-wing Automatic Revolving Door Model DTAS (DuoTour AutoSlide) with 8 post anchor locations at each revolving door as manufactured by Boon Edam, Inc., 4050 South 500 West, Salt Lake City, Utah 84123, (801) 261-8980 Fax: (801) 261-1612. Diameter per drawings.

B. Revolving Entrance Door Assembly:

1. Operation: Automatic.

2. Activation and Safety Devices:

a. M.M.S. (Microwave Motion Sensors): Two (2) microwave motion detectors mounted to the canopy on each side of the door that will start the rotation of the door upon actuation. Detection pattern must be adjustable.

b. H.B.S. (Horizontal Boon Sensor): Two (2) pairs of active infrared sensors mounted on the leading wing of the showcase. These sensors provide a safety zone in front of the showcase and center panels. The door slows down when the higher beam is activated. The door will stop immediately when a person or object activates the lower beam.

c. E.B.S. (Endwall Buffer Sensors): Two (2) active infrared sensors mounted in front of the fixed curved side walls that will detect presence in front of the curved side walls and stop the rotation of the door immediately. The EBS sensors are programmed to switch "on" as each showcase approaches the endpost of the sidewall. The EBS sensors shall switch "off" as each door wing departs the endpost of each sidewall.

d. Rotating E.B.S. Sensors: Two (2) active infrared sensors mounted within the ceiling in front of the curved rotating showcase that will detect presence and stop the rotation of the door immediately.

e. S.B.S. (Showcase "Toe-Guard" Sensor): Two (2) active infrared proximity sensors mounted at the bottom of the leading edge of the rotating showcase.

f. S.R.B. (Sensor Rail Bentwall): Two (2) multi-directional, closed-contact pressure sensitive switches contained within a black rubber profile mounted to the edge of each inbound endpost that will immediately stop the door's rotation immediately if compressed.

g. Rotating S.R.B. Switch: Two (2) multi-directional, closed-contact pressure sensitive switches contained within a black rubber profile mounted to the lead edge of each rotating wall that will immediately stop the door's rotation if compressed.

h. Handicap Button: Two (2) Handicap "Push to Slow" Buttons mounted on the inbound endposts that will reduce the rotating speed of the revolving door to approximately 1/2 the regular speed for approximately one revolution.

i. Emergency Stop Button: Two (2) Emergency Stop Buttons mounted on the inbound endposts that will immediately stop the door when pressed.

j. Key-Switch: Provide a post-mounted key switch that will allow for the following options:

1) On/Off.
2) Lock the door in winter position.
3) Start the door from summer/winter position.
4) Turn the revolving door "off" and turn the sliding doors "on" (Requires the optional sliding door package).

k. Slide Door Safety Package: Provide 2 Ceiling Mounted, Active Infrared, Threshold Safety Sensors that will detect presence within the sliding door area. Also, provide 2 side panel active infrared safety sensors that will protect the fixed panel sidelight area of the automatic sliding door package.

C. Drive System: The door unit shall be powered by a perimeter-mounted drive system consisting of two (2) 1/2 HP asynchronous AC motors attached to 6" wheels mounted to the internal rotating ring. The motors shall be powered by a 208-230 VAC, 1-phase service. The motor shall utilize an internal angle encoder for constant monitoring of door position and a Frequency Controller to provide for the following characteristics:

1. Adjustment of rotation speed through a digital setting.

2. Adjustment of slow rotation speed through a digital setting.

3. Constant monitoring and regulation of rotation speed.

4. Independent adjustment of startup and run torque through digital settings to minimize force required to stop door.

5. Adjustment of stopping distance through a digital setting.

6. Removable remote control programmer for security over Frequency Control settings.

D. Battery Back Up System: A UPS battery backup system shall be provided to provide rotation to an egress position upon power failure. The drive system shall allow for manual rotation in case of power failure.

E. Braking Assembly: A DC braking assembly shall be incorporated within the drive system to perform positive braking and stopping.

F. Controls: Door controls shall be microprocessor-based utilizing a 2000-step Programmable Logic Controller (PLC) with the following characteristics:

1. RAM & ROM memory.

2. Lithium battery backup.

3. Self-diagnostics for quick detection of problem source.

4. Visual display of problem source.

G. Electric Locking: A fail-safe electromagnetic locking device shall be incorporated within the two drive system motors to prevent rotation of the door when the three (3) position post-mounted key switch is set to the locked position. Electric locking shall be disengaged by loss of power or signal from building/fire/smoke alarm.

2.5 FABRICATION

A. General: Prefabricate revolving entrance door assembly components to designs, sizes, thicknesses, and configurations indicated. Factory test revolving doors for proper operation prior to shipping to site. Carefully cut and fit all components.

1. Weld reinforcing firmly in place. Glued in reinforcements and stiffeners not permitted.

2. Glazing Stops and Gaskets: Manufacturer's standard snap-on, extruded-aluminum, square glazing stops with minimum wall thickness of 0.062 inch (1.6 mm); and preformed resilient glazing gaskets.
3. Reinforcement: Provide reinforcement for hardware and operating mechanism necessary to meet performance requirements and to withstand operating stresses without metal or glass failure.
4. Weather Stripping: Install in stiles and in head and sill rails to be adjustable and replaceable without dismantling door wings.
5. Security Components: Provide all cutouts, and prewiring, required for revolving door work to accept security system components. Wherever framing components are to receive wiring provide unobstructed clear paths free of burrs and sharp objects with pull strings to facilitate wiring.

B. Door Construction:

1. Sliding Door Panels: A pair of non collapsing bi-parting automatic sliding doors shall be provided and constructed with 1-3/4" wide aluminum extrusions with minimum thickness of 0.125" and reinforced in the corners with solid aluminum machined bar stock. The automatic sliding doors shall be driven by an independent belt drive DC motor attached to a structural header recessed in the revolving door ceiling. The two automatic bi-parting sliding doors shall incorporate removable horsehair weather stripping. The automatic bi-parting sliding doors shall be held in position with non-jamming electromagnetic locks. Upon release by door controls, or building fire/smoke alarm, the bi-parting automatic sliding door panels will automatically slide open to assist with the building smoke evacuation system. Upon receiving the building fire/smoke alarm signal, the revolving door will always rotate to the "3 o'clock – 9 o'clock position". As soon as the door reaches this position, the automatic bi-parting sliding doors will activate and remain in the "open" position.

2. Rotating Showcase: The showcase shall be manufactured with proportionate "showcase extension panels." The leading edge panel shall incorporate the safety sensor system specified under paragraph 2.4B2 that will protect the area in front of the showcase area. The sensors shall be of 'Transmitter-Receiver' type technology to ensure reliable and accurate safety sensing. The trailing edge shall not extend more than 20" to ensure consistent and orderly exiting throughput.

C. Enclosure Walls and Ceilings: Fabricate tubular and channel frame assemblies in configuration indicated, with welded or mechanical joints according to manufacturer's standards and as specified. Provide subframes and reinforcement of types indicated or, if not indicated, as required for a complete system to support required loads.

1. Provide eight (8) heavy-duty aluminum enclosure wall posts with minimum thickness of 0.3125".

2. Exterior Framing: Fabricate components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior. Provide anchorage and alignment brackets for concealed support of assembly from the building structure. Allow for thermal expansion of exterior units.

D. Factory-Glazed Door Fabrication: Glaze door wings at the factory. Comply with glazing requirements specified in this Section and in Division 8 Section "Glazing."

2.6 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.7 ALUMINUM FINISHES

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

2.8 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.
2. Coating for Aluminum, and Carbon Steel Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Refer to Division 8 Section “Glazed Aluminum Curtain Walls”.

END OF SECTION 08 42 33
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SECTION 08 44 13 - GLAZED ALUMINUM CURTAIN WALLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazed aluminum curtain wall assemblies for the entire project. The aluminum curtain wall assemblies work includes the following:
   1. Aluminum curtain wall and storefront framing.
   2. Swinging, and automatic revolving entrance doors and framing, including hardware, stripping and thresholds.
   3. Aluminum metal panels, condensate gutter, handrails attached to framing, and louvers.
   4. Aluminum trim, snap in sealant stops, flashings, and similar items in conjunction with aluminum curtain wall assemblies.
   5. Painting and coating in conjunction with the above aluminum items.
   6. Internal steel and aluminum reinforcements.
   7. Miscellaneous steel framing which serves to support the glazed aluminum window wall, curtain wall, storefront, and metal wall panel assemblies and which extends to the building structural framing system.
   8. Internal and perimeter sealing, joint fillers, weeps, vents and gasketing systems.
   9. Anchors, embedments, shims, fasteners, inserts, expansion devices, expansion joints, accessories, support brackets, attachments, and grout.
   10. Exterior wall insulation and firesafing.
   11. Glass and glazing for curtain walls, entrances and storefronts.
   12. Curtain wall, entrance and storefront sample installations.
   13. Curtain wall mock-up and testing, and field testing.
   14. Security system components will be incorporated into the door and frame openings of all entrance work. Cooperate with the Owner's security system contractors to incorporate security system components during the course of the Work.
   15. The responsibility for all exterior wall air and water systems design and the on-site control for alignment of all exterior wall components inclusive of those under the metal panel cladding subcontractors responsibility.

B. The Owner will engage an independent testing and inspection agency to verify the adequacy of the Contractor’s quality control; refer to Division 1 Section “Quality Control.” Before concealing the window, window wall and curtain wall work obtain the required inspections of same from a representative of the Owner’s independent testing and inspection agency.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide glazed aluminum curtain wall systems meeting or exceeding the following performance requirements:

   1. Structural Properties:

      a. Wind Loads:

1) Exterior Walls: The exterior glazed aluminum curtain wall work, including glass, shall be designed, fabricated and installed to withstand the maximum wind pressures as follows:

a) Negative Pressure (Suction): 38 psf.

b) Positive Pressure: 35 psf.

2) Interior Walls: The interior aluminum entrance and storefront work, including glass, shall be designed, fabricated and installed to withstand a maximum inward and outward wind pressure of 5 lbf/sq. ft. for the sidelights and 20 lbf/sq. ft. for the active door panels.

b. Seismic Loads: As required by the International Building Code, 2003, ed. Calculated seismic movements are available from the structural engineer.

c. Deflection Limitations:

1) Deflections: Base calculations for the following deflections upon the combination of maximum direct wind loads, building deflections, thermal stresses, and erection tolerances.

a) The deflection of any framing member in a direction normal to the plane of the wall when subjected to the full code required wind loads specified above shall not exceed 1/240 of its clear span or 3/4 inch (19 mm) whichever is less, except limit deflection of glass to 1 inch (25.4 mm) for exterior walls 1/2 inch (13 mm) for interior walls. Span is defined as the distance between anchor centerlines; for cantilevers, span is defined as the distance between anchor center line and the end of the cantilever.

b) Glass, sealants and interior finishes shall not be included to contribute to framing member strength, stiffness or lateral stability.

c) Cantilever Deflection: The deflection of a framing member overhanging an anchor point shall be limited to L/120 unless otherwise specified where L is the length of the cantilevered member.

2) Do not permit any permanent deformation (set) in the metal framing work. Permanent deformation, fastener, weld, or gasket failure, component breakage or disengagement shall not occur under wind loading equal to 1.5 times the wind loads (positive or negative). Permanent deformation shall be taken as deflection without recovery exceeding 1/1000 times span.

d. Dead Loads:

1) Maximum full deadload deflections, parallel (in-plane) to wall plane, of framing members shall not reduce glass bite or glass coverage, to less than 75% of the design dimension, and shall not reduce edge clearance to less than 25% of design dimension or 1/8 inch (3 mm) whichever is greater.

2) Limit deflections of metal members spanning door openings to 1/300. The clearance between the member and an operable door shall be no less than 1/16 inch (1.5 mm).

3) Twisting (rotation) of the horizontals due to the weight of the glass shall not exceed 1 degree, measured between ends and center of each span.

e. Uniform Structural Loads: Recent satisfactory uniform wind loading tests, acceptable to the Architect, of each glazed curtain wall assembly (each window, window wall, curtain wall, entrance and storefront) shall have been conducted in accordance with the requirements of ASTM E330. Each assembly shall have been subjected to inward and outward acting uniform loads equal to 1.5 times the inward and outward acting design wind loads specified above under paragraph 'wind loads'. Satisfactory performance at these loads shall mean no glass or other component breakage, component disengagement, and no permanent deformation of main framing members in excess of the permanent deformation criteria specified above. The qualification of 'recent' test results is to limit the glazed curtain wall assemblies being provided for the project to only those which have been tested within the last seven years and under conditions similar to the project requirements.

1) In the absence of satisfactory test results a full scale laboratory mock up and testing program shall be required and conducted to the extent required to show compliance with the performance requirements.

f. Operational (Traffic) Loads: Design and fabricate entrances to withstand the operating loads which result from heavy traffic conditions using the specified hardware, without measurable permanent deflection. Limit elastic deflections so as to provide the normal degree of rigidity required to avoid glass breakage, air leaks and other objectionable results of excessive flexibility. Provide weatherstripping at stiles, sill and head rails of door leaves, to minimize air, water and sound leaks.

B. Air Leakage:

1. Typical Conditions: Air leakage through each glazed aluminum curtain wall assembly, by infiltration and exfiltration, shall not have exceeded 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of fixed wall area when it was tested in accordance with ASTM E 283 at a static-air-pressure difference of 6.24 lbf/sq. ft. (300 Pa).

2. Revolving Door Air Leakage: Air leakage through each revolving entrance door shall not have exceeded 1.25 cfm/lineal foot of crack when tested in accordance with ASTM E 283 at a static-air-pressure difference of 1.57 lbf/sq. ft. (75 Pa) with the wings in the cross position.

C. Water Penetration:

1. Water penetration in this specification is defined as the appearance of uncontrolled water, other than condensation, on any indoor face of any part of the exterior wall that is not contained or drained back to the exterior, or that can cause damage to adjacent materials or finishes. Water contained within drained flashings, gutters, and sills is not considered water leakage. This definition of leakage of water replaces those contained under AAMA 501.1, paragraph 5.4 and ASTM E331, paragraph 3.2.3.
2. Provision shall be made to drain to the exterior face of the wall any water entering the system.

3. No uncontrolled water penetration shall occur when each glazed aluminum curtain wall assembly (each window, window wall, curtain wall, entrance and storefront wall) is tested in accordance with the ASTM E331 and AAMA 501.1 for one 15 minute cycle at a static and dynamic pressure difference of 15 lbf/sq. ft. minimum.

D. Thermal Movements: Fabricate the exterior glazed aluminum curtain wall work to accommodate for such expansion and contraction of component materials, and supporting elements, as will be caused by surface temperatures ranging from -10 degrees F. to +180 deg F (+82 deg C), without causing noise, buckling, glass breakage, failure of joint sealants, undue stress on metal members and fasteners, failure of doors or other operating units to function properly, reduction of performance, and other detrimental effects.

1. Dimensions shown on Drawings are based on an assumed design temperature of +70 deg F (+21 deg C). Fabrication and erection procedures shall take into account the ambient temperature range at the time of the respective operations.

E. Building Frame Movement: Design, fabricate and install glazed aluminum curtain walls to withstand building movements including thermal movements, loading deflections, shrinkage, creep and similar movements without glass breakage, anchor failures, or structural damage. Thermal movements shall be as specified above. The typical building frame deflections are indicated below, localized building frame deflections, shrinkage, creep and other movements are available from the structural engineer.

F. Condensation Resistance: Design, fabricate, and install the glazed aluminum curtain wall systems to prevent the formation of condensation on the indoor face with the building heating and ventilating system in normal operation. HVAC operation parameters are available from the mechanical engineer. Submit with the Proposal Drawings a computer generated thermal analysis showing temperature gradients through each component of the glazed aluminum curtain wall and location of dew point.

G. Glass Statistical Factor: Glass thicknesses when shown on the drawings, or specified, are for convenience of detailing only and are to be confirmed by the Contractor and/or glass manufacturer. All glass for the size openings shown will be provided in thicknesses such that the probability of breakage at the design "Wind Load" will not exceed 8 lights per 1000 lights (S.F. 2.5) based on a 3 second uniform gust load duration, and reflectance and shading indicated. The glass manufacturer shall provide, on request, substantiating glass breakage data if such data is not otherwise available as manufacturer's published data.

1. The minimum glass thickness permitted shall be 6.0 mm.

H. Louvers: As follows, determined by testing units 48 inches (1200 mm) wide by 48 inches (1200 mm) high per AMCA 500:

1. Free Area: When using bird screen minimum free area shall be 50%.
2. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
3. Design, fabricate, and install louver assemblies to prevent objectionable noises when installed assembly is subjected to the minimum to the maximum required wind loads.

I. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

J. Design Modifications:

1. Submit design modifications necessary to meet the performance requirements and field coordination.
2. Variations in details or materials shall not adversely affect the appearance, durability or strength of components, nor shall such variations cause excessive stress, or deflections, to the building structural frame.
3. Maintain the general design concept without altering size of members, profiles and alignment.

1.3 SUBMITTALS

A. Proposal Drawings: The Architectural drawings indicate the design concept in regard to the overall size, shape and location of the glazed aluminum curtain wall components and together with the interrelated exterior wall materials specifications impose the performance requirements and outline the material selections, fabrication methods and installation procedures for the completion of the glazed aluminum curtain wall work.

1. Each bidding entity shall include with its proposal, coordinated proposal drawings and calculations for the purpose of indicating execution of the design concept and the bidder’s proposed glazed aluminum curtain wall system, compliance with the performance requirements, and material and fabrication method selections. Note; these drawings and calculations are not to be construed as "Shop Drawings" and does not relieve the bidding entity of the responsibility of providing "Shop Drawings" as specified.

2. The proposal drawing submission shall include an itemized list of specification and drawing requirements which are not embodied within the Contract Documents for the glazed aluminum curtain wall work. Identify the specification page and paragraph, or the drawing sheet, elevation, plan, section, or detail for each item. Deviations not specifically identified in this manner shall not be deemed valid in submittal review, and shall be cause for submittal disapproval at the reviewer’s discretion. In the event that there are no deviations, provide a written statement of full compliance with the specifications and drawings. Failure to provide an itemized list of deviations, in the required form, or a statement of full compliance shall, at the reviewer’s discretion, be cause for return of any and all submittals for acceptance without review with bidding entity responsible for any resultant delay.

B. Product Data: Submit manufacturer's specifications and installation instructions for each glazed aluminum curtain wall component specified.

C. Shop Drawings:

1. Submit production shop drawings and calculations to the Architect. The production shop drawings shall show scaled elevations, plans, and sections of the glazed aluminum curtain wall work. Full scale sections shall be prepared and submitted for details of the assemblies that cannot be shown in the elevations or sections. Include with shop drawings metal thickness of all metal components, glass thicknesses, location of permanent safety glass markings on each glass type, metal finishes, and all other pertinent information as necessary or requested by the Architect to indicate compliance with the Contract Documents. Details of field connections, anchorage, and their

relationship to the work of others shall be clearly indicated for the coordination of the work by other building trades. Details of fastening and sealing methods and product joinery shall be shown to ensure proper performance of the field installation. No work shall be fabricated until shop drawings for that work have been approved by Architect for fabrication.

a. The intent of the foregoing is to prohibit fabrication of exterior wall system components (curtain wall and corrugated metal wall panels) prior to the results of the testing laboratory mock-up and testing program, it is not intended to preclude the submittal of shop drawings (i.e. manufacturers data, calculations, warranties, samples, etc.) for the exterior wall systems prior to field testing .

b. Each drawing sheet shall be signed and sealed by a single structural engineer licensed in the State of Maine and retained by the Contractor.

D. Samples: Submit samples of the following before any work is fabricated:

1. 3 paired sets of samples for each exposed metal finish required. Sample finishes shall be on the specified alloy, temper, and thickness of metal required for the work. Where finishes involve color and texture variations, include sample sets showing the full range of variations expected. Furnish samples in either 12-inch- (300-mm) squares of sheet.

2. Submit 18 x 24 inch (450 x 600-mm) cut away samples of metal panels. The metal panel samples shall demonstrate welded corner joints, reinforcements, and stiffeners.

E. Structural Calculations: Submit, for information only, copies of structural calculations indicating complete compliance with the specified performance requirements Include calculations to show that maximum deflections do not exceed specified performance requirements under full design loading, calculations for louvers, panels, frames, connections and glass manufacturer performed computer analyses showing that probability of breakage at the design wind pressure, and under the specified service temperature range, will not exceed the specified probability of breakage for each type, size, and thickness of glass . Each sheet of calculations shall be prepared, signed and sealed by a Professional Engineer registered in the State of Maine.

F. Field Test Reports: Submit field testing reports.

G. Product Test Reports: Submit RECENT certified product test reports based on tests performed by an AAMA Accredited Laboratory clearly describing in written form, and in shop drawing form, compliance of each glazed aluminum curtain wall assembly (each window, window wall, curtain wall, entrance and storefront) with requirements indicated based on comprehensive testing.

H. Maintenance Instructions: Submit copies of manufacturer's written instructions for adjustment, operation and maintenance of swinging doors.

I. Preconstruction Sealant Compatibility and Adhesion Testing: Submit test results.

J. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
   a. Include a statement indicating costs for each product having recycled content.
3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
   a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Award the fabrication of glazed aluminum curtain wall components to a single firm specializing in the fabrication of glazed aluminum curtain wall components who has successfully produced work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 5 years. The fabricator shall have sufficient production capacity, have organized quality control and testing procedures, and published written and illustrated installation manuals, to produce and properly install the entrance assemblies required without causing delay in progress of the Work.

B. Installer Qualifications: Subcontract the glazed aluminum curtain wall work to a firm which is specialized in the erection of curtain walls and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years.

   1. The glazed aluminum curtain wall engineering, including support and connection to building structural framing, shall be performed and sealed by a licensed professional engineer registered in the State of Maine.

      a. The connection systems, where indicated, are suggested for the glazed aluminum curtain wall installation. The final design of all connection systems shall be the sole responsibility of the glazed aluminum curtain wall subcontractor and thereafter the Contractor for acceptance and inclusion into the Project.

   2. Subcontract the automatic entrance door work to a firm which is certified and recognized by the American Association of Automatic Door Manufacturers (AAADM). The firm shall be specialized in the erection of entrances and storefronts and who has successfully installed work similar in design and extent to that required for the project, in not less than three projects of similar scope to the satisfaction of the Architect, and whose work has resulted in construction with a record of successful in-service performance for a period of 10 years, and who is an authorized representative of the manufacturer for both the installation and maintenance of the type of units required for the project.

C. Testing laboratories shall be specifically qualified, and AAMA accredited, to conduct field performance tests required by these specifications and acceptable to the Owner and the Architect. The glazed curtain wall subcontractor's own test facilities will not be acceptable.

1. The following laboratories are known to comply with the requirements:

a. Architectural Testing Inc., York, PA.
b. Construction Testing Laboratories, Inc., Miami, FL.

2. Testing: Conduct tests of each specified sample installation under the direction of the Owner's Independent Testing and Inspection Agency in the presence of the Architect, the Contractor, various component manufacturers and fabricators and the Installer for each specified system to be field tested. Proceed with each test only after acceptance of the detailed outline of test procedure.

D. Field Testing:

1. Field Testing: Test the sample installations in accordance with the following field test methods. Conduct tests of each specified sample installation under the direction of the testing laboratory in the presence of the Owner, Architect, the Contractor, various component manufacturers and fabricators and the installer for each specified system incorporated in the sample installations.

a. Field Test for Water Leakage:

1) Water Spray Test with Static Air Pressure Difference: ASTM E1105 and AAMA 503-92 conducted at a Uniform Static Test Pressure of 15 lbf/sq. ft.
2) Correct all failures observed as a result of this test at no additional cost to the Owner, if requested by the Architect.

E. Preconstruction Sealant Compatibility and Adhesion Testing: Test results confirming compatibility and adhesion are mandatory for all concealed and exposed sealant materials in contact with exterior glazing, other sealants, flashings, metal framing, and shims prior to full size sample installation construction. Refer to Section 07 92 00, "Joint Sealants" for specific testing requirements, and anticipated lead time necessary to perform testing.

F. Standards: Comply with the applicable provisions and recommendations of the following standards below, where standards conflict the more stringent shall apply and where a conflict between any stated standard and a project specific requirement of the specifications arise the more stringent provision shall prevail.

1. Aluminum Association (AA):

a. No. 1 "Aluminum Standards and Data."
b. "Aluminum Design Manual."

2. American Architectural Manufacturers Association (AAMA):

a. AAMA "Metal Curtain Wall Manual".
b. AAMA "Aluminum Curtain Wall Design Guide Manual," Volumes 1-9.
c. AAMA "Curtain Wall Manual #10."

d. AAMA "Aluminum Store Front and Entrance Design Guide Manual."
e. AAMA 501.1, “Specification for Method of Test for Metal Curtain Walls for Water Penetration Using Dynamic Pressure.”
f. AAMA 503, “Field Testing of Metal Store Fronts, Curtain Walls and Sloped Glazing Systems.”
g. AAMA 2603, "Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum."
h. AAMA 2605, “Specification for Superior Performing Organic Coatings on Architectural Extrusions and Panels.”

3. American Institute of Steel Construction (AISC), "Steel Construction Manual," Current Edition.

4. American Society for Testing and Materials (ASTM):

a. ASTM E283, “Test Method for Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences Across the Specimen.”
b. ASTM E330, “Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.”
c. ASTM E331, “Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.”
d. ASTM E1105, “Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference.”

5. Builders Hardware Manufacturers Association (BHMA): ANSI/BHMA A156.10, "Power Operated Pedestrian Doors."

a. Emergency Exit Door Requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

6. Underwriters Laboratories (UL): Provide power door operators that comply with UL 325.

7. National Association of Architectural Metal Manufacturers (NAAMM), “Metal Finishes Manual”.

8. Steel Structures Painting Council (SSPC): "Steel Structures Painting Manual, Vol. 2, Systems and Specifications".

9. Federal Standard 16 CFR 1201, Consumer Product Safety Commission (CPSC): "Safety Standard for Architectural Glazing Materials," as published in the Code of Federal Regulations (CFR). Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide safety glazing complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.

10. Welding Standards: Welding shall be performed by skilled and qualified mechanics. Welding shall be performed in accordance with the applicable provisions of AWS D1.1 “Structural Welding Code - Steel” and AWS D1.2, "Structural Welding Code--Aluminum."

G. Sample Installations: After the construction and acceptance of testing mock-up(s), construct sample installations of the final exterior wall assemblies where shown on the drawings.

1. General: Sample installations will be used as a standard for judging acceptability of work for the Project. Replace unsatisfactory work as directed. Maintain sample installations during construction as a standard for judging acceptability of the exterior wall work. Properly finished, maintained, and performing sample installations shall be retained as a portion of the completed work.

2. Size: Provide full sized sample installations to the extent indicated on the drawings, or if not indicated, as directed by the Architect. Sample installations shall be built on site complete with all glass, aluminum framing, adjacent cladding materials, anchors, connections, flashings, sealants, and joint fillers as accepted on the final shop drawings. Do not take special precautions or use techniques that do not represent those to be used on the work. Do not enclose the interior side of the wall with interior finishes and insulation materials.

3. Refer to the following sections for related materials and requirements for their incorporation into the sample installation(s):

a. Section 07 62 00, “Sheet Metal Flashing and Trim”.
b. Section 07 92 00, “Joint Sealants”.
c. Section 08 80 00, “Glazing”.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Prior to the start of the curtain wall work, and at the Contractor's direction, meet at the site and review the construction schedule, availability of materials, installers personnel qualifications, equipment and facilities needed to make progress and avoid delays, installation procedures, testing, inspecting, and certification procedures, and coordination with other work. Meeting shall include Contractor, Owner, curtain wall installer, sealant installer, as well as any other subcontractors or material technical service representatives whose work, or products, must be coordinated with the curtain wall work.

1.5 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. General: Comply with the applicable provisions of AAMA "Curtain Wall Manual #10" for the care and handling of curtain wall work from shop to site.

B. All components of the curtain wall work shall be identified after fabrication by marks clearly indicating their location in the building. Packaging of components shall be so selected to protect the components from damage during shipping and handling.

C. Storage on Site:

1. Store curtain wall components in a location and in a manner to avoid damage to the components. Stacking shall be done in a way which will prevent bending, excessive pressure, abrasion or other permanent damage of the component and its finished surfaces.
2. Store curtain wall components and materials in a clean, dry location, away from uncured concrete, masonry work, sprayed on fireproofing work, and other construction activities. Cover with non-staining waterproof paper, tarpaulin, or polyethylene sheeting in a manner that will permit circulation of air inside the covering.

D. Keep handling on site to a minimum. Exercise particular care to avoid damage to finishes of metals.

1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions of supporting structure by field measurements before fabrication so that the curtain wall work will be accurately designed, fabricated and fitted to the structure. Indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Use Contractor's lines and benchmarks as a basis for measurements.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating curtain wall work without field measurements. Coordinate supporting structure construction to ensure actual dimensions correspond to established dimensions.

1.7 WARRANTY

A. Special Warranty: Submit a 5 year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the curtain wall installer agreeing to repair or replace components of curtain wall systems that develop defects in materials or workmanship within the specified warranty period. Defects include, structural failures, sealant failures, deterioration of metals, metal finishes, and other materials beyond normal weathering, failure of operating components to function properly, uncontrolled water leakage, uncontrolled air leakage, and any other evidence of failure or deterioration of the curtain wall work to meet performance requirements.

B. Warranty, High Performance Organic Coatings: Submit a warranty for a period of 5 years, warranting the integrity of film and permanence of color of the high performance organic coatings for the following. Submit form of warranty with bid proposal.

1. Color fade not to exceed 5 delta E units (Hunter) as calculated in accordance with ASTM D2244 on exposed surfaces cleaned with clean water and a soft cloth.
2. Degree of chalking not to exceed rating No. 8 when measured in accordance with ASTM D659 on exposed unwashed surfaces.
3. Will not crack, check or peel.

PART 2 - PRODUCTS

2.1 MATERIALS- CURTAIN WALL (EXTERIOR)

A. Aluminum: Conform to the requirements published in AA "Aluminum Standards and Data", referenced ASTM standards and the following. All aluminum extrusions shall be manufactured to dimensional tolerances so as to eliminate any edge projection or misalignment at joints. Unless otherwise specified, provide alloy and temper as required to suit performance requirements and finish(es) indicated. Provide concealed extruded bars, rods, shapes and tubes in alloys as recommended by the fabricator to join or reinforce assembly of exposed aluminum components.

1. Alloys:

a. Sheet and Plate: Alloy 5005 and ASTM B 209 (ASTM B 209M).
b. Extruded Bars, Rods, Shapes, and Tubes: Alloy 6063 and ASTM B 221 (ASTM B 221M).
c. Bars, Rods, and Wire: ASTM B 211 (ASTM B 211M).
d. Sand Castings: ASTM B 26 (ASTM B 26M).
e. Permanent Mold Castings: ASTM B 108.

2. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
3. Shapes and Thickness: Provide shapes as shown and as required to suit the performance requirements but with wall thickness of not less than the following:

a. Minimum Wall Thickness for Structural Extrusions: 1/8 inch (3 mm).
b. Minimum Wall Thickness for Non-Structural Extrusions: 1/16 inch (1.5 mm).

B. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold-rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

C. Anchors and Fasteners:

1. Material: Stainless steel.
2. Anchor and Fastener Metal Alloy Types, Designations and Standards: Alloys as selected by fabricator to prevent corrosion resistance with the components fastened. Do not use self-drilling, self-tapping type fasteners.
3. Where fasteners are subject to loosening or turn out from thermal and structural movements, wind loads, or vibration, use self-locking devices.

D. Concealed Flashing: Dead-soft, 0.018-inch- (0.457-mm-) thick stainless steel, complying with ASTM A 666, Type 304.

E. Door Hardware: Refer to Section 08 71 00, “Door Hardware”.

F. Aluminum Entrance Doors and Frames: Refer to Section 08 41 13, “Aluminum Entrances and Storefronts”.

G. Revolving Entrance Doors and Frames: Refer to Section 08 42 33, “Revolving Door Entrances”.

H. Sound Deadening for Metal Panels: Type as recommended by panel manufacturer for application shown.

2.2 SEALING, GLASS AND GLAZING MATERIALS

A. Concealed Sealing Materials: All sealing materials concealed within the glazed aluminum curtain walls shall be silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

B. Exposed Sealing Materials: All sealing materials exposed at glazed aluminum curtain wall perimeter joints in contact with adjacent cladding materials: Silicone, refer to Section 07 92 00, "Joint Sealants".

C. Glass and Glazing Materials: Refer to Section 08 80 00, "Glazing".

2.3 OTHER ALUMINUM CURTAIN WALL COMPONENTS

A. Metal Panels and Copings: Refer to Section 07 42 43: COMPOSITE METAL WALL PANELS

B. Condensate Gutters: Provide shop fabricated (preformed) extruded aluminum units of the type, size, and profiles required to form a complete and continuous waterproof and weatherproof gutter system complete with prefabricated corner units, expansion joints, and anchoring devices.

C. Sheet Metal Partition Filler Panels: Form sheet metal filler panels from 0.05" thick aluminum sheet for closing ends of gypsum wallboard partitions. Produce flat, flush surfaces without cracking and grain separation at bends. Incorporate reveals, trim, and concealed anchorages for attachment to adjacent surfaces. Adhesively attach vinyl foam sealant tape to filler panel edges which abut adjacent surfaces to form a continuous seal. Use vinyl foam sealant tape material set onto edge of filler panel. Uncompressed tape thickness shall be sized to fit ¾" wide joint indicated with an additional thickness as required to provide a minimum 15% foam compression. Laminate layers of tape as recommended by the manufacturer to provide a single tape thickness for the joint indicated. Fill interior of panel with sound deadening mineral fiber insulation permanently attached to inside panel faces.

1. Vinyl Foam Sealant Tape: Closed cell, low density, self adhesive, PVC foam sealant tape of approximately 13 Shore 00 hardness (ASTM D2240) and a density of 6 pcf (ASTM D1667). Norseal V730; Norton Performance Plastics Corp.

D. Thermal Break Construction: Provide concealed rigid nylon pulltrusion (isobar or ensinger type) isolators of profile and hardness as recommended by the glazed aluminum curtain wall fabricator, and fabricated to a cross sectional profile to interlock with aluminum extrusions for thermal isolation of exterior window framing components to interior window framing components.

E. Slip and Separator Gaskets:

1. Bolted Slip Joints: Non-metallic, low friction material bearing temperature and moisture resistances and low abrasion properties as required to suit performance requirements.

2. Non-Bolted Slip Joints: Non-corrosive, non-toxic impregnated felt, or butyl tape with a pressure sensitive adhesive on one surface which is formulated for proper adhesion to metals indicated; gasket shall bear temperature and moisture resistance properties as required to suit performance criteria; thickness and width as required.

F. Baffle Material: Reticulated foam baffle material with a pore count (ppi) as required by assembly fabricator to suit performance requirements.

G. Insulation: Refer to Sections 07 21 00, "Thermal Insulation" and 07 84 46 "Fire Resistive Joint Systems" for fire safing and firestopping to be used in conjunction with glazed curtain wall assemblies.

H. Snap In Sealant Stops: Provide rigid PVC sealant stops of profile and hardness as recommended by the window fabricator, and fabricated to a cross sectional profile to interlock with aluminum extrusions at all window perimeters.

I. Louvers: Refer to Section 08 91 00, "Louvers and Vents".

J. Miscellaneous Steel: Refer to Section 05 50 00, "Metal Fabrications".

K. Cold Formed Steel Framing: Refer to Section 05 40 00, "Cold Formed Metal Framing". Deflection criteria and specifics in this section shall govern in case of conflict.

L. Expansion Joints: Refer to Section 05 81 00, EXTERIOR WALL EXPANSION JOINTS.

2.4 FABRICATION

A. General: Fabricate the glazed aluminum curtain walls to the designs, shapes, and sizes shown using the materials specified and shown to produce assemblies which meet or exceed the performance requirements. To the greatest extent possible complete fabrication, assembly, finishing, hardware applications and other work before shipment to Project site.

B. Joints in Metal Work: All exposed work shall be carefully fitted and matched to produce continuity of line and design, with all joints, being accurately fitted for hairline contact and rigidly secured. Where additional rigidity or strength is required to satisfy the performance requirements reinforce curtain wall components with aluminum or carbon steel shapes, bars, and plates.

C. Shop Assembly: As far as practible, all fitting and assembly work shall be done in a fabrication shop.

1. Framing members attaching curtain wall components to building supports shall provide for 3 way adjustment to accommodate fabrication and construction tolerances, and allow for thermal and building movements.
2. Provide vents, weepholes and internal water passages in the glazing framing recesses as recommended by the respective glass and framing manufacturers to conduct infiltrating water to the exterior, and to avoid condensation at glass spandrel unit air spaces. Provide weep baffles secured to inside of frame behind vents and weepholes.
3. Provide flush endcaps for all mullion extension cap extrusions.

4. Provisions for reglazing from interior for vision glass and exterior for spandrel glazing or panels.

D. Exposed Fasteners: Not permitted.

E. Protection of Metals: Wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc, separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires. Wherever aluminum comes in contact with concrete surfaces separate such surfaces with a coating of zinc rich primer, bituminous paint, or separation gaskets as the condition requires.

F. Welding: Complete the welding of exposed surfaces prior to finishing.

1. All welding shall be in accordance with the recommendations of the AWS and shall be performed with electrodes and/or by methods recommended by suppliers of the metal being welded. Fabricate welded aluminum assemblies so that fraying surfaces are free rinsing and will not trap coating solutions.
2. Welds behind finished surfaces shall be so performed as to eliminate distortion, and discoloration, on the finished side. Plug, puddle, and spot welding are not permitted. Provide low heat filled welds using a chill bar on finished side to eliminate dimpling, distortion, and/or discoloration on the finished side. If weld heads appear on the finished surface, the weld head shall be ground, and polished to match and blend with the finish on adjacent parent metal. Weld spatter and welding oxides on finished surfaces shall be removed immediately.
3. At joints where welding cannot be performed use concealed stainless steel fasteners to join assembly.

G. Shop Painting of Carbon Steel: Ungalvanized steel items shall be thoroughly cleaned of all loose scale, filings, dirt, and other foreign matter, in accordance with SSPC SP3 “Power Tool Clean”, and painted with coating as specified for carbon steel surfaces.

2.5 I am suggesting you delete these paragraphs as I thought that your entire facede was to be stick built in the field and not shop assembled, shipped to site, and attached to the building frame.ALUMINUM FINISHES

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish Application:

1. Apply high performance organic coatings to all exposed exterior surfaces of glazed aluminum curtain wall components. Apply thermosetting acrylic enamel coatings to all exposed interior surfaces of glazed aluminum curtain wall components.

2. Adhesion and Compatibility Testing: Test samples of aluminum coatings on aluminum will be required for compatibility and adhesion testing of all sealants proposed for use on framing components. Refer to Section 07 92 00, “Joint Sealants.”

C. Appearance of Finished Work: During production, maintain large size color range samples for use in comparing against production material. Variations in appearance of abutting or adjacent

pieces are acceptable if they are within the range of approved samples. Noticeable variations in the same piece are not acceptable.

D. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

E. High-Performance Organic Coating Finish: AA-C12C42R1x and the following:

1. Polyvinylidene fluoride finish coating containing not less than 70% of "ATO Atochem Kynar 500" or "Ausimont Hylar 5000" fluorocarbon resin specially formulated for spray application to extrusions and preformed aluminum metal shapes. Remove die markings, scratches, abrasions, dents and other blemishes before applying finish. Coating films shall be uniform and visibly free from flow lines, streaks, blisters, sags or other surface imperfections in the dry-film state on all surfaces.

a. Metal Preparation and Pretreatment: Pretreatment of aluminum surface and application of the finish shall be performed under specifications issued by the licensed formulator to approved applicator and the following as a minimum:

1) The products used to form the chemical conversion coating on aluminum extrusions shall conform with ASTM D1730, Type B, Method 5 (Amorphous Chromium Phosphate Treatment) or Method 7 (Amorphous Chromate Treatment).
2) The coating weight of the chemical conversion coating shall be a minimum of 40 mg. per $ft.^2$ on exposed surfaces as specified in ASTM B449, Section 6, Class I. Processing shall conform with that specified in ASTM B449, Section 5.

b. Thickness:

1) Fluoropolymer 3-Coat Coating System: Minimum 1.6 mil total dry film thickness (0.25 mil primer +/- 0.05 mil and 1.35 mil topcoat).

c. Coating Performance Criteria: Meets or exceeding AAMA 2605.

1) Colors: Custom color to match Architect’s sample.

d. Manufacturer, Coating System:

1) Three Coat, Opaque System; one of the following:

a) PPG Industries; Duranar.
b) Valspar, Inc.; Fluropon Standard.

2.6 COATINGS FOR CONCEALED METAL SURFACES

A. General: The following protective coatings shall be applied to surfaces of metals which are to be concealed in the construction:

1. Coating for Carbon Steel: Hot dip galvanized, complying with ASTM A123.

2. Coating for Aluminum and Carbon Steel: Where aluminum or carbon steel surfaces are to be in contact with each other or in contact with dissimilar materials such as masonry or concrete, and where hot dip galvanizing of carbon steel is incompatible with component parts because of galvanic action or component fabrication tolerances provide one of the following:

   a. Bituminous Paint: Cold-applied, non-sagging, asphalt-mastic paint complying with SSPC-Paint 12 requirements, except containing no asbestos. Apply in two coats for an overall minimum dry film thickness of 25 mils.
   b. Zinc Rich Primer: Organic zinc-rich primer, complying with SSPC-Paint 20.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate glazed aluminum curtain wall work with the work of other Sections and provide items to be placed during the installation of other work at the proper time to avoid delays in the work.

B. Place such items, including concealed overhead framing, accurately in relation to the final location of glazed aluminum curtain wall components.

3.2 EXAMINATION

A. Examine the substrates, adjoining construction, and conditions under which the Work is to be installed. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Before beginning installation of the glazed aluminum curtain wall work examine all parts of the building structural frame and the building cladding indicated to support the glazed aluminum curtain wall work. Notify Contractor in writing, of any dimensions, or conditions, found which will prevent the proper execution of the glazed aluminum curtain wall work, including specified tolerances. Use Contractor's offset lines and bench marks as basis of measurements.

3.3 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing glazed aluminum curtain wall systems. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure nonmovement joints. Seal joints watertight. Clean excess joint sealants from finished surfaces.

1. Cut and trim component parts of the glazed aluminum curtain wall work during erection only with the approval of the manufacturer or fabricator, and in accordance with his recommendations. Restore finish completely to protect material and remove all evidence of cutting and trimming. Remove and replace members where cutting and trimming has impaired strength or appearance, as directed by Architect.

2. Set components within the erection tolerances with uniform joints. Place components on shims and fasten to supporting substrates using bolts and similar fasteners. Use stainless steel shims at structural connections only. U shaped shims at structural connections are not permitted. Use aluminum, stainless steel, or high impact polystyrene shims at other connections.
3. Do not erect components which are warped, deformed, bowed, dented, defaced or otherwise damaged as to impair its strength or appearance. Remove and replace members damaged in the process of erection.
4. Coat concealed surfaces of dissimilar materials, and any ferrous metal components, with a heavy coating of bituminous paint, zinc rich primer or other separation in accordance with manufacturer's recommendations. Where aluminum components will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.
5. No holes or slots shall be burned, cut into, or field drilled in any building framing member without the written acceptance of the structural engineer.

B. Glazed Aluminum Curtain Wall, Entrance and Storefront Framing: Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

C. Entrance Doors: Doors shall be securely anchored in place to a straight, plumb and level condition, without distortion. Adjust doors to provide a tight fit at contact points for weathertight closure and to operate smoothly, without binding, with hardware functioning properly. Weatherstripping contact, and hardware movement, shall be field tested and final adjustment, and lubrication, made for proper operation and performance of doors.

1. Door Hardware: Refer to Section 08 71 00 “Door Hardware”.
2. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
3. Set, seal, and grout floor closer cases as required to suit hardware and substrate indicated.
4. Set sill members in a bed of polyurethane sealant to provide weathertight construction. Comply with requirements of Section 07 92 00, “Joint Sealants”.
5. Set automatic entrance door header assemblies, operating brackets, and guides level and true to location with anchorage for permanent support.
6. Install complete automatic door operator system in accordance with door manufacturers instructions including controls, control wiring, and power units.

    a. Refer to Division Division 26Sections for connection to electrical power distribution system.

D. Louvers, and Metal Panels: Install components plumb and true in alignment with established lines and grades. Refer to Sections 08 91 00, .Louvers and Vents and 07 42 43 Composite Metal Panels for additional installation requirements.

E. Sheet Metal Partition Filler Panels: Locate and place partition filler panels plumb, level, and in alignment with adjacent construction, with uniform reveals as shown. Provide concealed foam tapes, and install as the installation progresses to make installations acoustically sealed and light tight. Do not penetrate window and curtain wall framing with any type of fastenings.

F. Flashing: Install flashings fabricated from specified flashing material to the profiles shown. Flashings shall be furnished in single piece lengths. Laps and joints, where required, shall be

lap seamed by a minimum of 4 inches (100 mm) with lap completely embedded in sealant. Mechanical fasteners shall be used where necessary to maintain contact of overlapping elements. Spot heads of all fasteners with sealant. Refer to Section 07 62 00, 'Sheet Metal Flashing and Trim'.

G. Install glazing to comply with requirements of Section 08 80 00, "Glazing," unless otherwise indicated.

H. Install perimeter sealant to comply with requirements of Section 07 92 00, "Joint Sealants," unless otherwise indicated.

I. Concealed Sealing Components: Apply sealant and gasket components which are integral to the glazed aluminum curtain wall systems in strict accordance with the each component manufacturers printed instructions. Before applying components remove all mortar, dust, dirt, moisture, and other foreign matter which will be deleterious to the intended performance of the component. Mask adjoining exposed surfaces to avoid spilling, dripping, dropping or other unintended contact of the sealing components onto adjacent exposed surfaces.

J. Field Applied Insulation:

1. Exterior Wall Building Insulation: Install insulation materials as specified in Section 07 21 00, "Thermal Insulation."
2. Firesafing: Clean debris from behind curtain wall framing during erection and provide temporary closures to prevent further accumulation of debris. Install firesafing to comply with local authorities having jurisdiction and AAMA TIR-A3 "Fire Resistive Design Guidelines for Curtain Wall Assemblies". Install firesafing with securely anchored metal flanges or make equivalent provisions to prevent dislocation. Comply with the requirements of Section 07 84 46 'Fire Resistive Joint Systems.'

3.4 ERECTION TOLERANCES

A. The glazed aluminum curtain wall systems shall be fabricated and erected to accommodate the dimensional tolerances of the structural frame and surrounding cladding while providing the following as installed tolerances.

1. Variation from theoretical calculated position as located in plan or elevation in relation to established floors lines, column lines and other fixed elements of the structure, including variations from plumb, level, straight and member size: +/- ¼ inch max in any 20'-0" (+/- 6 mm in any 6 m) run, column-to-column bay, or floor-to-floor height.
2. Alignment: Where surfaces abut in line, and meet at corners, limit offset from true alignment to 1/32 inch (.75 mm).
3. Variation from angle, or plumb, shown: +/- 1/8 inch max in any 10'-0" (+/- 3 mm in any 3 m) run or story height, non-cumulative.
4. Variation from slope, or level, shown: +/- 1/8 inch max in any 20'-0" (+/- 3 mm in any 6 m) run or column-to-column bay, non-cumulative.

3.5 ANCHORAGE

A. Anchorage of the glazed aluminum curtain wall work to the structure and surrounding cladding shall be in accordance with the accepted shop drawings.

3.6 WELDING

A. Weld with electrodes and by methods recommended by manufacturer of material being welded, and in accordance with AWS D1.1 for concealed steel members.

B. Welds and adjacent metal areas shall be thoroughly cleaned and coated with a single coat of bituminous paint.

3.7 REMOVAL OF DEBRIS

A. All debris caused by, or incidental to, the erection of the glazed aluminum curtain wall work shall be removed from the site and disposed of legally.

3.8 CLEANING

A. Clean metal surfaces promptly after installation, exercising care to avoid damage to factory finished exposed surfaces.

B. Wash glass on both faces not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer. Remove excess glazing and sealant compounds, dirt, and other substances.

C. Immediately remove any deleterious material from surfaces of aluminum.

3.9 PROTECTION

A. Institute protective measures required throughout the remainder of the construction period to ensure that glazed aluminum curtain wall work will be without damage or deterioration, other than normal weathering, at time of acceptance.

END OF SECTION 08 44 13

SECTION 08 71 00 - DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes door hardware.

1.2 SUBMITTALS

A. Product Data: Submit product data including installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Samples: Submit samples of exposed door hardware for each type indicated below, in specified finish. Tag with full description for coordination with the Door Hardware Schedule.

1. Door Hardware: As follows:

a. Locks and latches.
b. Operating trim.

2. Samples will be returned to Contractor. Units that are acceptable and remain undamaged through submittal, review, and field comparison process may, after final check of operation, be incorporated into the Work, within limitations of keying requirements.

C. Door Hardware Schedule: Submit door hardware schedule prepared by or under the supervision of door hardware supplier. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware. The Architect's review of schedule shall neither be construed as a complete check nor shall it relieve the Contractor of responsibility for errors, deviations, or omissions from the specified requirements to provide complete door hardware for the project.

1. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening.

a. Organize door hardware sets in same order as in the Door Hardware Schedule at the end of Part 3.

2. Content: Include the following information:

a. Type, style, function, size, label, hand, and finish of each door hardware item.
b. Manufacturer of each item.
c. Fastenings and other pertinent information.
d. Location of each door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
e. Explanation of abbreviations, symbols, and codes contained in schedule.
f. Mounting locations for door hardware. Supply templates to door and frame manufacturer(s) to enable proper and accurate sizing and locations of cutouts for

hardware. Detail any conditions requiring custom extended lip strikes, or any other special or custom conditions.

g. Door and frame sizes and materials.

D. Keying Schedule: Submit keying schedule prepared by or under the supervision of supplier, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

E. Warranties: Submit special warranties specified in this Section.

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

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

B. Supplier Qualifications: Door hardware supplier, who has completed a minimum of three (3) projects over the last 5 years which were similar in material, design and extent to that indicated for the project - as determined by the Architect – and which have resulted in construction with a record of successful in service performance, and who is or employs a qualified Architectural Hardware Consultant, available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

1. Scheduling Responsibility: Preparation of door hardware and keying schedules.

C. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

D. Regulatory Requirements: Comply with the following:

1. Provide hardware items complying with the applicable provisions for accessibility and usability by the disabled and handicapped in compliance with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG), Section 4.13."
2. Electrified Door Hardware: Listed and classified by Underwriter’s Laboratories, Inc. or by a testing agency acceptable to authorities having jurisdiction, as suitable for the purpose indicated.
3. Hardware for doors in the path of egress shall comply with International Building Code (IBC) Chapter 10 and NFPA 101 Chapter 7.

E. Fire-Rated Door Assemblies: Provide door hardware for assemblies complying with NFPA 80 that are listed and labeled by Underwriter’s Laboratories, Inc. for fire ratings indicated, based on testing according to NFPA 252. Provide only door hardware items that are identical to items tested by UL for the types and sizes of doors required. In case of conflict between type of hardware specified and type required for accessibility or fire protection, furnish type required by

NFPA and UL. Doors indicated in fire rated partitions and walls shall be positive latching and self-closing, with smoke gaskets where required by applicable codes.

1. Wherever exit device hardware is required on doors, comply with UL 305. Furnish hardware to door manufacturer for installation at factory. Provide supplementary label, “Fire Exit Hardware”, on each exit device to certify that exit hardware has been panic load tested with door.

F. Keying Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Incorporate 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.

G. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to electrified door hardware including, but not limited to, the following:

1. Inspect and discuss electrical roughing-in and other preparatory work performed by other trades.
2. Review sequence of operation for each type of electrified door hardware.
3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review required testing, inspecting, and certifying procedures.

1.4 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 Schedule, and include basic installation instructions with each item or package.

1.5 COORDINATION

A. Coordinate layout and installation of recessed closers with floor construction. Cast anchoring inserts into concrete.

B. Templates: Furnish templates and door hardware schedules, coordinated for the application of door hardware items with door and frame details, to door opening fabricators and trades performing door opening work to permit the preparation of doors and frames to receive the specified door hardware. Where the door hardware item scheduled is not adaptable to the finished size of door opening members requiring door hardware, submit an item having a

similar operation and quality to the Architect for review. Each door hardware item shall be fabricated to templates.

C. Electrical System Roughing-in: Coordinate layout and installation of electrified door hardware with connections to, power supplies, fire alarm system and detection devices, access control system, security system, building control system.

1.6 WARRANTY

A. Special Warranty: Written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Faulty operation of door hardware.
2. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

B. Warranty Period for Electromagnetic Locks: Five years from date of Substantial Completion.

C. Warranty Period for Manual Closers: Ten years from date of Substantial Completion.

D. Warranty Period for Concealed Floor Closers: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in this Section, door hardware sets are keyed to each scheduled door in the door and frame schedule, and the Door Hardware Schedule at the end of Part 3.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturer's products.
2. The hardware supplier shall review each hardware set and compare it with the door types, details, and sizes as shown and verify each hardware item for function, hand, backset, and method of fastening through shop drawing submittals.

2.2 HINGES AND PIVOTS

A. Butt Hinge Products and Manufacturers:

1. Standard Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8112, one of the following:

a. BB5000; Bommer Industries, Inc. (BI).
b. BB1279; Hager Companies (HAG).
c. TA2714; McKinney Products Company (MCK).
d. FBB179; Stanley Commercial Hardware (STH).

2. Heavy Weight, Ball Bearing, 5 Knuckle, Steel: Complying with BHMA A156.1 A8111, one of the following:

    a. BB5004; Bommer Industries, Inc. (BI).
    b. BB1168; Hager Companies (HAG).
    c. T4A3786; McKinney Products Company (MCK).
    d. FBB168; Stanley Commercial Hardware (STH).

3. Heavy Weight, Ball Bearing, 5 Knuckle, Stainless Steel: Complying with BHMA A156.1 A5111, one of the following:

    a. BB5006; Bommer Industries, Inc. (BI).
    b. BB1199; Hager Companies (HAG).
    c. T4A3386-32D; McKinney Products Company (MCK).
    d. FBB199(US32D); Stanley Commercial Hardware (STH).

4. Heavy Weight, Ball Bearing, 5 Knuckle, Steel, Concealed Electric 24V, 4 Wire: Complying with BHMA A156.1 A8111, one of the following:

    a. BB5064 (ETW04); Bommer Industries, Inc. (BI).
    b. BB1168 x ETW-4; Hager Companies (HAG).
    c. T4A3786 x CC-4; McKinney Products Company (MCK).
    d. CEFBB168-54; Stanley Commercial Hardware (STH).

5. Heavy Weight, Ball Bearing, 5 Knuckle, Stainless Steel, Concealed Electric 24V, 4 Wire: Complying with BHMA A156.1 A5111, one of the following:

    a. BB5066 (ETW04); Bommer Industries, Inc. (BI).
    b. BB1199 x ETW-4; Hager Companies (HAG).
    c. T4A3386-32D x CC-4; McKinney Products Company (MCK).
    d. CEFBB199(US32D)-54; Stanley Commercial Hardware (STH).

6. Standard Weight, Ball Bearing, 5 Knuckle, Steel, Concealed Electric 24V, 4 Wire: Complying with BHMA A156.1 A8112, one of the following:

    a. BB5060 (ETW04); Bommer Industries, Inc. (BI).
    b. BB1279 x ETW-4; Hager Companies (HAG).
    c. TA2714 x CC-4; McKinney Products Company (MCK).
    d. CEFBB179-54; Stanley Commercial Hardware (STH).

7. Standard Weight, Ball Bearing, 5 Knuckle, Stainless Steel: Complying with BHMA A156.1 A5112, one of the following:

    a. BB5002; Bommer Industries, Inc. (BI).
    b. BB1191; Hager Companies (HAG).
    c. TA2314-32D; McKinney Products Company (MCK).
    d. FBB191(US32D); Stanley Commercial Hardware (STH).

B. Pivot and Pivot Hinge Products and Manufacturers:

1. Offset Pivot with Floor Mounted Bottom Pivot: Mortised mounted, handed, 3/4 inch (19 mm) offset pivot set with sealed bearings for protection against weather and debris and composed of a head mounted top pivot and floor mounted bottom pivot. Furnish with extended spindles. Complying with BHMA A156.4 C07162.

    a. Model H147 Offset Hung Pivot Set; Rixson-Firemark, Inc. (RIX).

2. Intermediate Offset Pivots: Mortised jamb mounted, non-load bearing, handed, 3/4 inch (19 mm) offset intermediate pivots with sealed bearings for protection against weather and debris. Complying with BHMA A156.4 C07321 minimum vertical adjustment of 1/8 inch (3.2 mm).

    a. Model M190 x ¾ Intermediate Offset Pivots; Rixson-Firemark, Inc. (RIX).

3. Electrified Intermediate Offset Pivots: Concealed electric, low voltage, minimum 18 gauge insulated two wire, mortised jamb mounted, non-load bearing, handed, 3/4 inch (19 mm) offset intermediate pivots with sealed bearings for protection against weather and debris. Complying with BHMA A156.4 C07321 minimum vertical adjustment of 1/8 inch (3.2 mm).

    a. Model E-M19U ¾ Intermediate Offset Pivots; Rixson-Firemark, Inc. (RIX).

4. Center Pivots: Mortised mounted, non-handed, center pivot set with sealed bearings for protection against debris and composed of a head mounted top pivot and floor mounted bottom pivot. Furnish with extended spindles. Complying with BHMA A156.4 C07032.

    a. Model 370 Center Hung Pivot Set less top pivot (LTP) x Model 345 Center Hung Top Pivot; Rixson-Firemark, Inc. (RIX).

C. General Hinge and Pivot Characteristics: Where door jamb or trim projects to such an extent that the width of leaf specified will not allow the door to clear such frame or trim, furnish hinges and pivots with leaves of sufficient width to clear. Hinges and pivots shall be template hinges conforming to BHMA A156.1 and in accordance with door and frame material requirements.

D. Butt Hinge and Offset Pivot Hinge Quantity: Provide the following, unless otherwise indicated:

1. Three Hinges: For doors with heights of greater than 60 inches (1524 mm) to and including 90 inches (2286 mm).
2. Four Hinges: For doors with heights greater than 90 inches (2286 mm) to and including 120 inches (3048 mm).
3. Provide 4 hinges, plus 1 hinge for every 30 inches (750 mm) of door height greater than 120 inches (3048 mm).

E. Butt Hinge Sizes: 4-1/2 inches (114 mm) h. by 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors up to and including 36 inches (914 mm) in width; 5 inches (127 mm) h. by 4 inches (102 mm) or 4-1/2 inches (114 mm) w. for doors greater than 36 inches (914 mm) in width.

F. Hinge Characteristics: Full mortise type with square corners. All butt hinges are to have non-rising pins for interior hinges and all exterior butt and pivot hinges are to be made of non-

ferrous base metal and have non-removable pins (NRP). Provide only steel bodied butt hinges at labeled doors. All butt hinges shall be furnished with button tips.

G. Electrified Functions for Hinges: Furnish fully concealed circuit, tamper resistant, wired hinges at doors requiring power transfer or door monitoring from jamb to door. Furnish junction box and mortar shield for use with each wired hinge and ship directly to the door and frame manufacturer(s) for fastening to frame.

H. Fasteners: Package all hinges and pivots with machine screws as required by door and frame construction.

2.3 LOCKS AND LATCHES

A. Mortise Lock and Latch Sets: Heavy duty, commercial, mortise bodies complying with BHMA A156.13 Series 1000, Grade 1, with throughbolted lever trim. Furnish mortise type, field reversible, lock and latch sets with 1 or 2 piece anti-friction deadlocking brass or stainless steel latchbolts having a minimum 3/4 inch (19 mm) throw, 2-3/4 inches (70 mm) backset, and UL listed for 3 hour doors. All lock and latch sets, to be furnished complete with heavy gage wrought steel zinc dichromate or chrome plated case, trim, adjustable beveled square cornered armored fronts, steel or stainless steel hubs, and 7 pin interchangeable core cylinders. Conceal fastenings, washers and bushings. Provide wrought, or black plastic, box strikes for each lock and latch set with curved lips of sufficient length to protect frames. Provide solid forged or cast levers with wrought roses. Where lock functions are scheduled provide non-handed guard bolt and stainless steel deadbolt with a minimum 1 inch (25 mm) throw. Where electro-mechanical locksets are scheduled provide transformers properly sized for conversion of power supply to the power characteristics of the electromechanical locksets.

1. Sargent 8200 Series, **LNJ Design** x 130 KB Turnlever; Sargent Manufacturing Company (SGT). Provide handed ANSI 4-7/8” curved lip strikes die punched to match bolts provided with latchset functions only, provide non-handed standard curve lip strikes 82-0110 for all other functions. Where electro-mechanical locksets are scheduled provide 8270 Series with trim matching mechanical locksets.
2. Corbin-Russwin ML2000 Series, **Armstrong ASA Design** x 1300 Thumbturn Cylinders; Corbin Russwin Architectural Hardware (CR). Provide handed ANSI 4-7/8” curved lip strikes die punched to match bolts provided with latchset functions only 340L62 (RH) and 340L63 (LH), provide handed standard curve lip strikes for all other functions 340L60 (RH) and 340L61 (LH). Where electro-mechanical locksets are scheduled provide ML22903 ECL Series with trim matching mechanical locksets.
3. Schlage L9000 Series, **07 Design x A Rose**; Schlage Lock Company (SCH). Provide handed ANSI 4-7/8” curved lip strikes die punched to match bolts provided with latchset functions only (Part No. XL11-820/XL11-821), provide non-handed standard curve lip strikes for all other functions 10-072. Where electro-mechanical locksets are scheduled provide L9000EL Series with trim matching mechanical locksets.

B. Narrow Stile Mortised Deadlocks: Heavy duty, commercial, deadlock complying with BHMA A156 Type E8211, Grade 1. Furnish deadlocks less thumb turn and key cylinders. Where thumb turn, or key, cylinders are scheduled, furnish types as specified for mortise locks fitted with proper cams.

1. MS1850S Series x 4001 Box Strike; Adams-Rite Manufacturing Co. (ARM).

C. Keypad Locks:

1. Interior Type Keypads: A self contained, battery operated, microprocessor controlled keypad with non-volatile user memory that operates a mortised lockset. The keypad may be programmed as a momentary unlocking device or unlocked and used as a passage unit. The inside lever of the mortise lock shall always be free for egress. The lever trim for the interior type keypads shall match the trim for the mortised lock and latch sets. Other features shall include heavy duty, commercial, mortise lock bodies complying with BHMA A156.13 Series 1000, Grade 1, with throughbolted lever trim, 1 or 2 piece anti-friction deadlocking brass or stainless steel latchbolts having a minimum 3/4 inch (19 mm) throw, 2-3/4 inches (70 mm) backset, UL listed for 3 hour doors, heavy gage wrought steel zinc dichromate or chrome plated case, trim, adjustable beveled square cornered armored fronts, steel or stainless steel hubs, 7 pin interchangeable core cylinders, wrought, or black plastic, box strikes for each lock set with curved lips of sufficient length to protect frames, solid forged or cast levers with wrought roses, non-handed guard bolt, and 6 "AA" sized batteries per lockset. Provide fire-rated hardware as scheduled.

   a. Profile Series 11-8278LU; Sargent Manufacturing Company (SGT).

2. Exterior Type Keypads: Same as interior type keypads, except provide weatherseal type gasketing and spring loaded weathershield cover for keypads to protect devices from the exterior elements.

D. Key operated type readers: A standalone, battery operated, microprocessor controlled electronic key with a minimum of 16K bits of non-volatile user memory that operates a mortised lockset. A mortise controller shall be equipped with a 12” cable for connection to a rotating cylinder. All other system components shall match PWM’s existing standards and compatible with the existing programming and keying devices. Provide fire-rated hardware as scheduled.

1. Quantum Plus, Intellikey Corporation

E. Padlocks: Minimum 11/32-inch diameter hardened steel shackle with multiple plating for wear and corrosion resistance, case shall be machined from solid extruded brass, height of opening shall be minimum 2-inch. Housing shall be machined for interchangeable core.

1. 63-6300-758-HS; Sargent Manufacturing Company (SGT).
2. PL5070 Interchangeable Core (IC); Corbin Russwin Architectural Hardware (CR).
3. PL4000 Interchangeable Core Padlock; Schlage Lock Company (SCH).

2.4 DOOR BOLTS

A. Manual Flush Bolts: Provide flush bolts, with 1" wide fronts, in paired sets (top and bottom), with 1/2" diameter flattened bolt tip and standard 12" rod. Flush bolts shall fit ANSI A115.4 door and frame preparation. Flush bolts in wood and metal fire doors shall be A Label UL Listed. Bolts for fire doors to comply with BHMA A156.16, Type L14081, L14251 or L24081. Furnish rods of proper length to afford easy reach from the floor. Furnish manufacturers standard top strikes for top bolts.

1. Manual Flushbolts for Wood Doors: One of the following:

    a. No. 790F; Door Controls International (DCI).
    b. FB358; Ives: H. B. Ives (IVS).
    c. 3913; Triangle Brass Manufacturing Company, Inc. (TBM).
    d. 557; Rockwood Manufacturing Company (RM).

2. Manual Flushbolts for Metal Doors: One of the following:

    a. No. 780F; Door Controls International (DCI).
    b. FB458; Ives: H. B. Ives (IVS).
    c. 3917; Triangle Brass Manufacturing Company, Inc. (TBM).
    d. 555; Rockwood Manufacturing Company (RM).

B. Self-Latching Flush Bolt Assemblies for Metal Fire Doors: BHMA A156.3, Type 27; one of the following:

1. No. 845 (805 top bolt x 840 automatic bottom bolt); Door Controls International (DCI).
2. FB51P (FB51T constant latching top bolt x FB31B automatic bottom bolt; Ives: H. B. Ives (IVS).
3. 3820 (3820 x 3810); Triangle Brass Manufacturing Company, Inc. (TBM).
4. 1845 automatic flush bolt x constant self-latching top bolt; Rockwood Manufacturing Company (RM).

2.5 EXIT DEVICES

A. Exit Devices: Exit devices and exit device accessories shall conform to BHMA A156.3, Grade 1. Trim shall be wrought construction and commercial plain design with straight, beveled or smoothly rounded sides, corners and edges. Keyed devices shall be furnished less cylinders. Cylinders shall be as herein specified keyed to building system.

B. Push Pad Style Exit Devices: One of the following:

1. 80 Series, function and trim as scheduled; Sargent Manufacturing Company (SGT).
2. 99 Series, function and trim as scheduled; Von Duprin (VD).

C. 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.

D. Fire Exit 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.

E. Outside Trim: Match design for locksets and latchsets, unless otherwise indicated.

2.6 AUTOMATIC DOOR OPERATOR:

A. Characteristics:
    a) General: Provide electromechanical, transom mounted, power door operators complying with UL 325, ANSI A117.1, BHMA A156.10 (Power Operated Doors) and the ADA.

Operator shall be furnished as a complete assembly with standard double lever arm closer with double lever arm, track arm stop, one piece (full opening width metal cover), and electronic control module. There shall be no noise or vibration as the operator cycles the door. Provide separate conduits for high, and low, voltage wiring meeting UL and NEC electrical code requirements. Input power preparations shall be coordinated with electrical work.

b) Control Module: The electronic control module shall include provisions for electric security controls, adjustments for opening speed and force, soft start motor control to reduce strain and wear on the drive components. Provide on-board, low voltage power supply for actuators (motion detectors and push to enter and exit buttons) and security devices. Security devices will be provided by the Owners security contractor.

c) Product and Manufacturer: Horton, Series 4900 Full Power

2.7 CYLINDERS AND KEYING

A. Cylinders: Full faced interchangeable core cylinders with square shouldered (not tapered) compression rings, 7 pin cylinders, standard threaded, keyed into building system, with cams to suit lock functions. Provide cylinders for installation into all locks.

1. 1070 Series IC Mortise Cylinder; Corbin Russwin Architectural Hardware (CR).
2. Interchangeable Core Cylinder; Sargent Manufacturing Company (SGT).
3. 30-016 full-faced mortised interchangeable core cylinder housing with 36-083 compression rings; Schlage Lock Company (SCH).

B. Key Control Systems:

1. Model 1205-C; Lund Equipment Co., Inc.
2. Aristocrat AWC 450-S; Telkee, Inc.

C. Keying System: Final keying to determine lock cylinders, keyed alike sets, level of keying, master key groups, grandmaster keying system shall be as directed by the Owner. Supplier and Contractor shall meet with the Owner and obtain final instructions in writing. Provide 2 nickel silver keys for each lock, and 6 keys for each grandmaster and masterkey system. Provide 2 blank keys for each lock for the Owner's convenience in making additional keys.

1. Construction Keyed Cylinders: Provide construction keyed cylinders in locks during construction and as may be necessary for security or as may be requested by the Owner. Upon completion of the construction phase, construction keyed cylinders shall be voided mechanically without the removal of the cylinders from the locks. All construction keyed cylinders shall be individually keyed as required and subject to a single master key.

D. Key Control System: Furnish a key control system of the type specified. Furnish complete accessories including key gathering envelopes, labels, reserve pattern key tags with self-locking key clips, key receipt forms, key receipt holders, 3 way visible card index, temporary key markers and permanent key markers.

2.8 STRIKES

A. Strikes for Locks and Latches: All strikes for locks and latches shall be provided by the lock and latch manufacturer unless otherwise specified or scheduled, refer to Article 'Locks and Latches'.

B. Dustproof Floor Strikes: Complying with BHMA A156.16, Type L04251 or L14021, one of the following:

1. No. 80; Door Controls International.
2. DP2; H.B. Ives.
3. 3910; Triangle Brass Manufacturing Company, Inc. (TBM).
4. 570 x 571; Rockwood Manufacturing Company (RM).

C. Dustproof Threshold Strikes: Complying with BHMA A156.16, Type L2402X or L14011, one of the following:

1. No. 81; Door Controls International.
2. DP1; H.B. Ives.
3. 3911; Triangle Brass Manufacturing Company, Inc. (TBM).
4. 572; Rockwood Manufacturing Company (RM).

2.9 OPERATING TRIM (PUSHES AND PULLS)

A. Type 1: Not Used.

B. Type 2: Fabricate offset push pulls for back to back mounting from 1-inch (25-mm) diameter stainless steel bar stock in finish as scheduled. Custom fabricate pulls with minimum 3-1/4 inch (83-mm) projection, 2-1/4inch (57-mm) clearance, minimum 4-inch (102-mm) offset, 10-inch (245-mm) center to center of bases with center line of pull centered on door stiles. Furnish spanner turning washer and stud assemblies threaded to accept concealed throughbolt attachment including provision for spanner tightening of bolts of push/pull assembly. Do not provide baseplates at stile to pull interface. Provide one of the following:

1. 2952; Builder's Brass Works (BBW).
2. 1191-3; Triangle Brass Manufacturing Company, Inc. (TBM).
3. BF157; Rockwood Manufacturing Company (RM).

C. Type 3: Not Used.

D. Type 4: Not Used.

E. Type 5: Full mortised, solid, bronze or brass door edge pull, with 1/2 inch (13-mm) finger clearance, having nominal overall dimensions of 4 inches (102-mm) long by overall depth as required to accommodate the sum of the door thickness plus panel clips plus solid laminate panel system indicated, with minimum 11/16 inch (17.5-mm) backbend drilled and countersunk to receive 3 screw fasteners; form for full mortise application with lockedge face shaped for square or bevel cut edge as indicated; finish as scheduled.

1. SRO Style Edge Pull; Tydix (TY).

F. Type 6: Not Used

G. Type 7: Fabricate push plate/pull sets for back to back mounting. Fabricate pull from ¾" diameter stainless steel bar stock in finish as scheduled. Custom fabricate pulls with minimum 2-1/4" projection, minimum 1-1/2" clearance, 10" center to center of bases with centerline of pull centered on push plate. Mounting system for pull and plate shall be stud welded lugs on the back of the plate with threaded cone head machine and set screw assembles that provide a fully concealed mounting. Fabricate 4" x 16" plates from minimum 0.050 inch (1.3 mm) thick stainless steel, beveled top, bottom, and 2 sides (B4E), with square corners.

1. Push Pull Set No. 73CL x 108 pulls x 70C plate; Rockwood Manufacturing Company (RM).

2.10 ACCESSORIES FOR PAIRS OF DOORS

A. Tubular Coordinators and Filler Bars: UL listed for use on labeled doors and complying with BHMA A156.3, Type 21A. Provide with filler piece of length as required to close the header area and mounting brackets at stop mounted hardware. Furnish extenders at active leaf levers where required to clear overlapping astragals on doors installed with pocket pivot hinges or jambs with deep jamb stops.

1. No. 600 Series x Filler Bar; Door Controls International (DCI).
2. COR Series Coordinators x FL filler; H. B. Ives (IVS).
3. 1600 Series; Rockwood Manufacturing Company (RM).

2.11 CLOSERS

A. Overhead Surface-Mounted Closers: Closers shall be certified by ETL laboratories and the manufacturer to a minimum of 8,000,000 cycles and meet BHMA A156.4, Grade 1. Closers shall be warranted by the manufacturer against defects in materials and workmanship for a minimum of 10 years. Closers used in conjunction with overhead stops and holders shall be templated and coordinated to function properly. Properly detail closers to meet application requirements by providing drop plates, brackets, etc. to meet application and installation requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack pressure conditions, exposure to weather, and anticipated frequency of use. Closers shall have adjustable spring power, full rack and pinion, independent closing speed and latch regulating V-slotted valves, fully hydraulic with a high strength cast iron cylinder and solid forged steel arms, bore diameter of 1-1/2", pinion shaft diameter of 5/8", adjustable back check, cushion and built-in stop feature where scheduled, hold open arms where scheduled, delayed action where scheduled, arm finish to match closer cover finish scheduled. Provide metal covers of clean line design with plated or primed for paint finish as scheduled and that require removal in order to make adjustments to closer.

1. 4110/4010; LCN Closers (LCN).
2. 281; Sargent Manufacturing Company (SGT).

B. Overhead Concealed Closers, Offset Pivot Hung: Closers shall meet BHMA A156.4, Grade 1. Closers shall be warranted by the manufacturer against defects in materials and workmanship for a minimum of 10 years. Properly detail closers to meet application and installation

requirements as indicated. Comply with manufacturers recommendations for size of door closer depending on size of door, stack pressure conditions, and anticipated frequency of use. Provide manufacturers standard cover plate finished to match exposed portions of butts provided.

1. 2010; LCN Closers (LCN).
2. RTS 88 Series, Offset Slide Arm; Dorma.

2.12 PROTECTIVE TRIM UNITS

A. Kick and Armor Plates: Fabricate protection plates from minimum 0.050 inch (1.3 mm) thick stainless steel, beveled top and 2 sides (B3E), square corners, complying with BHMA A156.6, and fastened with oval head Phillips fasteners countersunk into plate surface.

1. Series 8400; Ives: H. B. Ives (IVS).
2. K1050 Doorplate Series; Rockwood Manufacturing Company (RM).
3. KA050-2 Armor Plate and KOO50 for Kickplates; Triangle Brass Manufacturing Company, Inc. (TBM).

B. Size: Furnish kick and armor plates sized 2 inches (51 mm) less than door width. Furnish kickplates in 12 inches (305 mm) heights, furnish armor plates in 48 inches (1219 mm) heights unless otherwise indicated. Provide protective plates with cutouts for locks, louvers and windows to the extent indicated. Mount protective plates flush with bottom of door.

2.13 STOPS AND HOLDERS

A. Angle Stops: Special angle stop, fabricated from brass or bronze, for single or pairs of doors without stops and having a minimum of 2 rubber silencers per stop, minimum 2 inches (51 mm) wide x 3 inches (76 mm) long base for mortising into the head of door frame, 1 inch (25 mm) maximum stop face projection; finish as scheduled.

1. AS18 Angle Stop; H. B. Ives (IVS).

B. Electromagnetic Door Hold Opens for Labeled Fire and Smoke Door Assemblies: Provide each electromagnetic door hold open with fail-safe operation, concealed wiring, door mounted contact plates with concealed mounting fasteners, shims, extensions, and installed approximately 6 inches in from lock edge of door. Comply with BHMA A156.15 for wall mounted single unit, to the extent indicated. Coordinate voltage and current characteristics with power supplied to holders, in addition coordinate with fire detectors and interface with fire alarm system.

1. Floor Mounted Single Unit – High Profile: Provide door holder assemblies with a total projection to clear hardware and trim projections.

   a. Model 980 Series; Rixson-Firemark, Inc. (RIX).
   b. Model 2600; Architectural Builders Hardware Mfg., Inc. (ABH).

C. Floor Stops: Cast half dome design with rubber bumper, finish as scheduled. Provide manufacturer's standard riser heights as required for carpeted areas in conjunction with the floor bumpers scheduled.

1. For Thresholds, Carpet and/or Undercut Doors: Comply with BHMA 156.16 Type L12161, L02161 or L12141.

    a. 3320X; Door Controls International (DCI).
    b. FS438; H.B. Ives (IVS).
    c. 1212; Triangle Brass Manufacturing Company, Inc. (TBM).
    d. 443; Rockwood Manufacturing Company (RM).

2. For Doors with Standard 3/8 inch (9.5 mm) Clearance: Comply with BHMA 156.16 Type L12161, L02141 or L12141.

    a. 3310X; Door Controls International (DCI).
    b. FS436; H.B. Ives (IVS).
    c. 1210; Triangle Brass Manufacturing Company, Inc. (TBM).
    d. 441; Rockwood Manufacturing Company (RM).

D. Silencers for Metal Door Frames: BHMA A156.16, Type L03011; grey rubber, minimum diameter 1/2 inch (13 mm); fabricated for drilled-in application to frame, specifically designed to form an air pocket to absorb shock and reduce noise of door closing. Provide 2 silencers for each pair of doors, 3 silencers for each single door.

1. 8S; Door Controls International (DCI).
2. SR64; H. B. Ives (IVS).
3. 1229A; Triangle Brass Manufacturing Company, Inc. (TBM).
4. 608; Rockwood Manufacturing Company (RM).

2.14 DOOR GASKETING (MEETING STILE, HEAD AND JAMB GASKETS, DOOR BOTTOM WEATHERSTRIPPING)

A. Type 1: Not Used.

B. Type 2: Not Used.

C. Type 3: Stop mounted, continuous extruded aluminum housing 1” x .625” retaining closed cell sponge neoprene gasket and snap on cover to conceal fasteners; finish as scheduled.

1. 376; Zero International, Inc. (ZRO).

D. Type 4: Continuous door bottom aluminum extrusion with continuous nylon brush pile sweep; sweep shall be field cut to length required to have positive contact with threshold without binding door.

1. 90137CP; Pemko.
2. C390MIL; Sealeze.

E. Type 5: Continuous stop applied extruded aluminum type, retaining continuous silicone or neoprene gasket, finish as scheduled.

1. 485; Zero International, Inc. (ZRO).
2. 316AS; Pemko Manufacturing Co., Inc. (PEM).

3. 890S; Hager Companies (HAG).

F. Meeting Stile Gasket: Paired set of gaskets which are continuous surface lock edge applied, extruded aluminum type, retaining replaceable nylon brush gasketing; brush shall be field butted, not overlapped; finish as scheduled.

1. 8192A; Zero International, Inc. (ZRO).
2. 18061CP; Pemko Manufacturing Co., Inc. (PEM).
3. 802S Astragals/Meeting Stiles; Hager Companies (HAG).

G. Door Bottoms: Continuous surface applied combination extruded aluminum drip and bulb gasket type door bottom manufactured from silicone or vinyl, finish as scheduled.

1. 777S; Hager Companies (HAG).
2. 210AV; Pemko Manufacturing Co., Inc. (PEM).

2.15 THRESHOLDS

A. Type 1: 1/2 inch (13 mm) high by 5 inches (127 mm) wide extruded aluminum double beveled saddle threshold.

1. 412SA; Hager Companies (HAG).
2. 171A; Pemko Manufacturing Co., Inc. (PEM).
3. S205A; Reese Enterprises, Inc. (RE).
4. 655A; Zero International, Inc. (ZRO).

B. Type 2: Not Used.

C. Type 3: Not Used.

D. Type 4: Not Used.

E. Type 5: 0.875” high by 5 inches wide extruded aluminum threshold with PVC thermal break and resilient rubber gasket.
1. 525 Zero International, Inc. (ZRO).

F. Type 6: 1/2 inch (12.7 mm) high by minimum 4-7/8 inches (123 mm) wide extruded aluminum threshold with resilient rubber gasket.

1. 477S; Hager Companies (HAG).
2. 2001AT; Pemko Manufacturing Co., Inc. (PEM).
3. 566A; Zero International, Inc. (ZRO).

G. Type 7: 1/2 inch (13 mm) high by 9-3/4 inches (248 mm) wide extruded aluminum double beveled saddle threshold, with mitered returns, and notched to receive pivot hinge unless otherwise scheduled.

1. 653S x custom width; Hager Companies (HAG).
2. Type 13 Saddle x custom width; Pemko Manufacturing Co., Inc. (PEM).
3. Type 3 x 9-3/4” Wide Aluminum Threshold with Mitered Returns; Rixson-Firemark, Inc. (RIX).

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. Horns: Provide flush mounting electric horns where scheduled for use as an immediate local audible warning device incorporated into the building security system. Each horn shall be furnished with a built-in strobe and operate at 24 VDC, have a current draw of 70 mA, and have 8 field-selected sound tones up to 2400 Hz.

1. 1910SF; Von Duprin, Inc. (VD).
2. 1910S-1; Locknetics.

C. Magnetic Switches: A fully mortised contact switch specifically designed for monitoring door opening positions. Switch shall be rated for up to 30 VDC, be a SPDT type operation, and have a current rating of .25 amps (resistive load).

1. MS-764; Von Duprin, Inc. (VD).
2. 7764; Locknetics.

D. Keyswitches: A keyswitch that is specifically designed to operate electro-mechanical door hardware and electric latch retraction exit devices. Each key switch shall have both momentary and SPDT contacts, for use with fail safe and fail secure locks. Rotating the key cylinder to the left actuates the maintained contact and rotating to the right actuates the momentary contact. Provide each keyswitch with narrow brushed weather resistant stainless steel faceplates that are sized to receive specified mortised cylinders. The contact rating shall be 24 VDC at 3 amps. Provide red and green LED signal light indicators on each keyswitch having current draw of 0.02 amps at 24 V.

1. KS920NL; Von Duprin, Inc. (VD).
2. 644-L2-WP Heavy Duty Keyswitch; Locknetics.

E. Lock Protector: Fabricated from heavy gauge metal and in finish as scheduled. Fabricate lock protectors with no exposed fasteners on face of lock protector. Furnish protectors sized to cover the latch bolt area of the door and lock and narrow enough to clear rose and escutcheon lock trims, offset formed to clear strike projection. Machine lock protectors where required to accommodate rose and escutcheon trims, and cylinders.
1. LG Series Lock Guards; H. B. Ives (IVS).

2.17 FABRICATION

A. Manufacturer's Nameplate: Provide each door hardware item without exposed manufacturers labels, names, or designs.

B. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, and sheet metal screws. Provide screws according to commercially recognized industry standards for application intended. Provide Phillips oval-head screws with finished heads to match surface of door hardware item being attached. Machine screws and expansion shields shall be used for attaching hardware to concrete and masonry.

1. Concealed Fasteners: All doors and door frames have been specified with adequate blocking and reinforcement provisions to eliminate exposed throughbolting of hardware items. Doors installed with exposed throughbolts will be rejected and replaced by the Contractor at no cost to the Owner.

2.18 FINISHES

A. Standard: Comply with BHMA A156.18.

B. Appearance of Finished Work: Finishes of the same designation, that come from 2 or more sources, shall match when the items are viewed at arms length and approximately 2' apart. Unless otherwise scheduled, match each hardware item in a single hardware set with the scheduled latch or lock set finish. Painting of BHMA 600 (USP) surfaces is required and is specified under Division 9 Section 'Painting':

C. Designations: The abbreviations used to schedule hardware finishes are generally BHMA (Federal Standards where indicated in parenthesis) designations. Comply with base material and finish requirements indicated by the following:

1. BHMA 600 (USP): Primed for painting.
2. BHMA 626 (US26D): Satin chromium plated.
3. BHMA 628 (US28): Satin aluminum, clear anodized.
4. BHMA 630 (US32D): Satin stainless steel.
5. Alum.: Aluminum.
6. BHMA 606 (US4): Satin brass, clear coated.

PART 3 - EXECUTION

3.1 PREPARATION

A. Hardware for fire door assemblies shall be installed in accordance with NFPA 80. Hardware for smoke control door assemblies shall be installed in accordance with NFPA 105. Install hardware for non-labeled and non-smoke door assemblies in accordance BHMA A156.1.115 (for steel doors and frames, and hardware manufacturers installation instructions for doors and frames fabricated from other than steel.

3.2 INSTALLATION

A. Mounting Heights: Mount door hardware units at the following heights, unless specifically indicated on the drawings or required to comply with governing regulations:

1. Locks and Latches: 38 inches (956 mm) to center of lever from finish floor.
2. Door Pulls: 44 inches (1118 mm) from finish floor to center of grip. Pull bases centered on door stiles, unless otherwise indicated.
3. Butt Hinges: 10 inches (254 mm) to bottom of lowest hinge from finish floor; 5 inches (127 mm) to top of upper hinge from top of door; space intermediate hinges equally between lower and upper hinges.

4. Flush Bolt Operating Mechanisms: Top bolt 66 to 72 inches (1676 to 1829 mm) from finish floor, bottom bolt 12 inches (305 mm) from finish floor.
5. Exit Device: 40 inches (1016 mm) from finish floor to center of touch bar.

B. Install each door hardware item to comply with manufacturer's written instructions. Install overhead surface closers for maximum degree of opening obtainable. Place on room side of corridor doors, stair side of stair doors, secondary corridor side of doors between corridors. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be finished, 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.

C. Do not install permanent key cylinders in locks until the time of preliminary acceptance by the Owner. At the time of preliminary acceptance, and in the presence of the Owner's representative, permanent key all lock cylinders. Record and file all keys in the key control system specified, and turn system over to Owner for sole possession and control.

D. Key control storage system shall be installed where directed by the Owner.

E. Thresholds: Thresholds shall be secured with a minimum of 3 fasteners per single door width and 6 fasteners per double door width with a maximum spacing of 12 inches (305 mm). Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch (19 mm) thread engagement into the floor or anchoring device used. Screw heads to be countersunk and flush with face of threshold. Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.3 ADJUSTING

A. Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every hardware component. Replace hardware components that cannot be adjusted to operate as intended. Adjust door control devices to compensate for building stack pressures and final operation of forced air mechanical equipment and to comply with referenced accessibility requirements.

1. Test each electrical hardware item to determine if devices are properly functioning. Wiring shall be tested for correct voltage, current carrying capacity, and proper grounding. Stray voltages in wiring shall be eliminated.
2. Coordinate with electrical installation for interface and connection with life safety and security systems.

3.4 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation. Clean hardware components as necessary to restore proper finish. Provide protection during the progress of the work and maintain conditions that ensure door hardware is in perfect working order and without damage or deterioration at time of Substantial Completion.

3.5 DOOR HARDWARE SCHEDULE – EXTERIOR SCHEDULED DOORS

Set No.	Quantity	Description	Finish
1	1-1/2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller with fire-rated escutcheon, Quantum Plus	US26D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Kickplate	US32D
2	1-1/2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Fire Exit Devices, 9975L-NL-F (fail safe function) x LNJ	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closers, (parallel arm) 4110-3077 CNS	USP
	1	Lock Protector	
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	2	Kickplates	US32D
3	1 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Butt, CEFBB199(US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Fire Exit Device, LX-RX-9975L-F x LNJ (except at Door 1525C, provide Panic Exit Device, LX-RX-9975L x LNJ)	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS871	---
	1	Kickplate	US32D
4	2 sets	Automatic Door Operator (with PUSH-N-GO option disabled)	
	2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1 pr.	Butts, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Electro-Mechanical lockset, LX-RX-8270 (fail safe function) x LNJ	US26D
	2 sets	Head and Jamb Gaskets (Type 5)	Alum.

	1	Meeting Stile Gasket	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	4	Armorplates	
	2	Floor Stops	US26D
	2	PWM Card Access Device to activate Automatic Door Operator (refer to access control drawings and specifications)	---
5	1-1/2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Panic Device, 9975L-BE (fail safe function) x LNJ	
	1	Overhead Surface Closers, (parallel arm) 4110-3077 CNS	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	2	Kickplates	US32D
6	1-1/2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Keypad 11-8278 LUJ x LNJ	US26D
		Keypad on Fixed Link (interior) side; RX on Jetbridge (exterior) side. (provide weather seal gasket, conduit and shroud for exterior application)	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closers, (regular arm with hold open) 4010-3049	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Kickplate	US32D
7	1	Overhead Concealed Closer, 2010-OP	US26D
	1 pr.	Custom Offset Pivots to accommodate added thickness to the door, with extended bottom spindles x mount bottom plate to slab concealed beneath threshold	US32D
	1	Custom Intermediate Offset Pivots	US32D
	1	Exit Device, 9947-EO-LBR (less bottom rod)	US26D
	1 set	Head and Jamb Gaskets, (Type 4)(fasten door sweeps to door bottomrail spacer bars with one brush each against inside face of interior and exterior exposures of door leaf)	Alum.
	1	Threshold (Type 7)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
8	1 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Butt, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-mechanical Lockset, LX- RX-8270	
	2	(fail safe function) LNJ	US26D
	1	Cylinder	US32D

	1	Overhead Surface Closer, (parallel arm) 4110	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Floor Stop	US26D
	1	PWM Card Access Device on exterior side (refer to access control drawings and specifications)	---
9	1 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Butt, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-mechanical Lockset, LX- RX-8270 (fail safe function) LNJ	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Floor Stop	US26D
	1	PWM Card Access Device (refer to access control drawings and specifications)	---
10	1 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Butt, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-mechanical Lockset, LX-8270 (fail safe function) LNJ	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6) (set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Floor Stop	US26D
	2	PWM Card Access Device on Apron (exterior) side (refer to access control drawings and specifications)	---
11	1 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	1	Butts, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Fire Exit Devices, RX-EL9975L-F (fail safe function) x LNJ	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closers, (parallel arm) 4110-3077 CNS	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.

	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS871	---
	2	Kickplates	US32D
	1	PWM Card Access Device on Apron (exterior) side (refer to access control drawings and specifications)	---
12	2 pr.	Butts, FBB 199 (NRP)(US32D)	US32D
	2	Butts, CEFBB199 (US32D)-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Fire Exit Device, E-RX-9975L-F (fail safe function) LNJ	US26D
	1	Fire Exit Device, E-RX-9947L-F (fail safe function) LNJ	US26D
	2	Cylinders	US32D
	2	Overhead Surface Closer, (parallel arm) 4110	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS871	---
	2	Kickplates	US32D

3.6 DOOR HARDWARE SCHEDULE – INTERIOR SCHEDULED DOORS

Set No.	Quantity	Description	Finish
51	1-1/2 pr.	Butts, FBB 179	USP
	1	Keypad 11-8278 LUJ x LNJ (provide 12-8278 at Doors 1518 and 1523) Keypad on Public side; RX on Office side.	US26D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	3	Silencers	---
	1	Floor Stop	US26D
52	1 1/2 pr.	Butts, FBB 179	USP
	1	Mortised Lockset, 8205 (office function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller, Quantum Plus	US26D
	3	Silencers	---
	1	Floor Stop	US26D
53	1 pr.	Butts, FBB 168 (except at Door 1504, provide FBB 179)	USP
	1	Butt, CEFBB168-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES) (except at Door 1504, provide CEFBB179-54)	USP

	1	Electro-mechanical Lockset, RX-8270 (fail safe function) LNJ	US26D
	1	Overhead Surface Closer, (parallel arm) 4110 (except at Door 1504, provide (regular arm) 4010)	USP
	3	Silencers	---
	1	Kickplate (on Room side except Door 1504)	US32D
	1	Floor Stop	US26D
	1	PWM Card Access Device (refer to access control drawings and specifications)	---
54	1 1/2 pr.	Butts, FBB 179	USP
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	3	Silencers	---
	1	Floor Stop	US26D
55	1 1/2 pr.	Butts, FBB 199 (provide Heavy Duty Hinges at doors scheduled to be cladded with Trespa.)	US32D
	1	Mortised Lockset, 49-8265 (privacy function with occupancy indicator) LNJ x Extended Spindle	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D
56	1-1/2 pr.	Butts, FBB 179	USP
	1	Keypad 11-8278 LUJ x LNJ (provide 12-8278 at Doors 1518 and 1523) Keypad on Public side; RX on Office side.	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D
57	1 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-Mechanical lockset, 8270 (fail safe function) LNJ	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D
	1	Kickplate	US32D
	2	TSA Card Access Device (refer to access control drawings and specifications)	---
58	1 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes	
	1	for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP

	1	Electro-Mechanical lockset, RX-8270 (fail safe function) LNJ	US26D
	1	Overhead Surface Closer, (regular arm) 4010 (except at Door 3507B, provide (parallel arm 4110)	USP
	3	Silencers	---
	1	Floor Stop	US26D
	1	Kickplate	US32D
	1	TSA Card Access Device on Checkpoint side (refer to access control drawings and specifications) (except at Door 3507B, provide Card Access Device on Security Ops side)	---
59	2-1/2 pr.	Butts, FBB 179 (NRP)	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 081100, STEEL DOORS AND FRAMES), active leaf	USP
	1	Electro-mechanical Lockset, 8270 (fail safe function) LNJ (active leaf- Left hand leaf on Pull side)	US26D
	2	Overhead Surface Closers, (parallel arm) 4110	USP
	1 set	Self-latching automatic flushbolts (inactive leaf)	US26D
	1	Dustproof floor strike (inactive leaf)	US26D
	1	Coordinator	USP
	2 sets	Silencers	---
	2	Floor Stops	US26D
	2	Kickplates	
	2	TSA/PWM Card Access Device (refer to access control drawings and specifications)	---
60	2-1/2 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES) (active leaf)	USP
	1	Electro-mechanical Lockset, 8270 (fail safe function) LNJ, (active leaf)	US26D
	1	Overhead Surface Closer, (regular arm) 4010 (active leaf)	USP
	1	Manual Flushbolt (inactive leaf)	US26D
	1	Dustproof Floor Strike (inactive leaf)	US26D
	2 sets	Silencers	---
	2	Floor Stops	US26D
	2	TSA Card Access Device (refer to access control drawings and specifications)	---
61	1-1/2 pr.	Butts, FBB 179	USP
	1	Mortised Latchset, 8215 (passage function) LNJ	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop (only at Door 3522A)	US26D

62	1-1/2 pr.	Butts, FBB 168	USP
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller, Quantum Plus	US26D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	3	Silencers	---
63	1-1/2 pr.	Butts, FBB 168	USP
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller, Quantum Plus	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D
64	1 pr.	Butts, FBB 168	US32D
	1	Butts, CEFBB168-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Exit Devices, E-CX-9975L (fail safe function) x LNJ lever trim on Holdroom side	US26D/US32D
	2	Cylinders	US32D
	1	Overhead Surface Closers, (regular arm) 4010	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS873	---
	1	Mag Holders: 24V	
	1	Door Release Button at Millwork Gate Counter (typ.)	---
	1	PWM Card Access Device on Holdroom side (refer to access control drawings and specifications)	---
65	1 pr.	Butts, FBB 179	US32D
	1	Butts, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Fire Exit Devices, E-CX9975L-F (fail safe function) x LNJ Lever trim with Nuisance Delay Option set to "ON"	US26D
	2	Cylinders	US32D
	1	Overhead Surface Closers, (parallel arm) 4110-3077 CNS	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS873	---
	1	Kickplate	US32D
	1	PWM Card Access Device on Fixed Link side (refer to access control drawings and specifications); RX on Stair side	---

66	1 set	Automatic Door Operator (with PUSH-N-GO option disabled)	
	1 pr.	Butts, FBB 179	US32D
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Keypad 11-8278 LUJ x LNJ	
	1	Fire Exit Device, 9975L-F (fail safe function) x LNJ lever trim	US26D
	2	Overhead Surface Closers, (parallel arm) 4110-3077 CNS	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	1	Floor Stop	US26D
	1	Keypad on Public side to activate Automatic Door Operator	
67	1-1/2 pr.	Butts, FBB 179	USP
	1	Mortised Lockset, 8217 (asylum or institutional function) LNJ	US26D
	3	Silencers	---
	1	Floor Stop	US26D
68	3-1/2 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES), active leaf	USP
	1	Electro-Mechanical lockset, RX-8270 (fail safe function), LNJ (active leaf)	US26D
	2	Overhead Surface Closers, (parallel arm) 4110	USP
	1	Self-latching Automatic Flushbolt (inactive leaf)	US26D
	1	Dustproof Floor Strike (inactive leaf)	US26D
	2	Coordinator	
	2 sets	Silencers	---
	1	PWM Card Access Device (refer to access control drawings and specifications)	---
69	1-1/2 pr.	Butts, FBB 168	USP
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller with fire-rated escutcheon, Quantum Plus	US26D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	3	Silencers	---
70	1-1/2 pr.	Butts, FBB 168	USP
	1	Mortised Lockset, 8204 (storeroom lock function) LNJ	US26D
	1	Rotating Cylinder, Quantum Plus	US26D
	1	Mortised Controller with fire-rated escutcheon, Quantum Plus	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D

71	1-1/2 pr.	Butts, FBB 179	USP
	1	Mortised Latchset, 8215 (passage function) LNJ	US26D
	3	Silencers	---
	1	Floor Stop	US26D
72	1	Overhead Concealed Closer, 2010-OP	US26D
	1 pr.	Offset Pivots, H147 x extended bottom spindles x mount bottom plate to slab concealed beneath threshold	US32D
	1	Intermediate Offset Pivots, M190	US32D
	1	Exit Device, 9947L-NL-LBR	US26D
	1 set	Head and Jamb Gaskets, (Type 4)(fasten door sweeps to door bottomrail spacer bars with one brush each against inside face of interior and exterior exposures of door leaf)	Alum.
	1	Threshold (Type 7)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
73	1-1/2 pr.	Butts, FBB 179 (NRP)(US32D)	US32D
	1	Fire Exit Device, 9975L-BE-F x LNJ lever trim	US26D/US32D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	3	Silencers	---
74	1-1/2 pr.	Butts, FBB 179 (NRP)(US32D)	US32D
	1	Panic Exit Device, 9975L-BE x LNJ lever trim	US26D/US32D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	3	Silencers	---
	1	Floor Stop	
75	3 pr.	Butts, FBB179	USP
	1	Mortised Lockset, 8204 (storeroom function) LNJ (active leaf)	US26D
	1	Rotating Cylinder, Quantum Plus	US32D
	1	Mortised Controller, Quantum Plus	US26D
	1	Overhead Surface Closer, (regular arm) 4010 (active leaf)	USP
	1 set	Manual Flushbolts (inactive leaf)	US26D
	1	Dustproof floor strike (inactive leaf)	US26D
	2 sets	Silencers	---
	2	Floor Stops	US26D
76		Refer to Section 08 42 29.23, SLIDING AUTOMATIC ENTRANCES	

77		Refer to Section 08 42 29.23, SLIDING AUTOMATIC ENTRANCES	---
78		Refer to Section 32 31 13, CHAIN LINK FENCES AND AND STORE FRONTS	
79	1	Padlock	US26D
80	1 pr.	Butts, FBB 179	US32D
	1	Butt, CEFBB179-54, 1 for each leaf (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Panic Exit Devices, E-CX9947L (fail safe function) x LNJ on Public side. Lever trim with Nuisance Delay Option set to "ON"	US26D/US32D
	1	Cylinder	US32D
	1	Overhead Surface Closer, (regular arm) 4010-3077	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	1	Power Supply, PS873	---
	1	PWM Card Access Device on Public side (refer to access control drawings and specifications)	---
	1	Motion Sensor on Corridor side	---
81	1 pr.	Butts, FBB 179 (NRP)(US32D)	US32D
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Exit Device, E-CX9975L-F (fail safe function) x LNJ	US26D
	1	Cylinder	US32D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	1	Lock Protector	US32D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07 92 00 JOINT SEALANTS)	Alum.
	1	Power Supply, PS873	---
	3	Silencers	---
	1	Floor Stop	US26D
82	1 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-Mechanical lockset, 8270 (fail safe function) LNJ	
	1	Overhead Surface Closer, (regular arm) 4010	USP

	3	Silencers	---
	1	Kickplate	US32D
	1	Floor Stop	US26D
	2	PWM Card Access Device (refer to access control drawings and specifications)	---
83	1-1/2 pr.	Butts, FBB 179	USP
	1	Mortised Lockset, 8216 (public entrance function) LNJ	US26D
	1	Overhead Surface Closer, (parallel arm) 4110	USP
	3	Silencers	---
	1	Floor Stop	US26D
84	1 set	Automatic Door Operator (with PUSH-N-GO option disabled)	
	1 pr.	Butts, FBB 179	US32D
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
		Electro-Mechanical lockset, LX-RX-8270 (fail safe function) LNJ	US26D
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	1	Floor Stop	US26D
	1	PWM Card Access Device on Public side	
	1	Wall Switch on Corridor side to activate Automatic Door Operator (refer to access control drawings and specifications)	---
85	2 pr.	Butts, FBB 179	US32D
	2	Butts, CEFBB179-54, 1 for each leaf (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Panic Exit Device, E-CX9975L (fail safe function) x LNJ	
	1	Panic Exit Device, E-CX9947L (fail safe function) x LNJ Lever trim with Nuisance Delay Option set to "ON"	US26D/US32D
	2	Cylinders	US32D
	2	Overhead Surface Closers, (regular arm) 4010-3077	USP
	2 sets	Head and Jamb Gaskets (Type 5)	Alum.
	1	Meeting Stile Gasket	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	2	Kickplates on Corridor side	US32D
	1	Power Supply, PS873	---
	1	TSA/PWM Card Access Device on Public side (refer to access control drawings and specifications)	---
	1	Motion Sensor on Corridor side	

86	1 pr.	Butts, FBB 179	USP
	1	Butt, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	USP
	1	Electro-Mechanical lockset, 8270 (fail safe function) LNJ	US26D
	1	Overhead Surface Closer, (regular arm) 4010	USP
	3	Silencers	---
	1	Floor Stop	US26D
	1	Kickplate	US32D
	2	TSA/ PWM Card Access Device (refer to access control drawings and specifications)	---
87	1 pr.	Butts, FBB 179 US32D	
	1	Butts, CEFBB179-54, (Sheet metal back boxes for electric hinges are specified under Section 08 11 00, STEEL DOORS AND FRAMES)	US32D
	1	Fire Exit Device, E-CX9975L-F (fail safe function) x LNJ Lever trim with Nuisance Delay Option set to "ON"	US26D
	2	Cylinders	US32D
	1	Overhead Surface Closers, (regular arm) 4010	USP
	1 set	Head and Jamb Gaskets (Type 5)	Alum.
	1	Threshold (Type 6)(set threshold in 2 lines of silicone sealant; refer to section 07920 JOINT SEALANTS)	Alum.
	2	Kickplates	US32D
	1	Power Supply, PS873	---
	2	PWM Card Access Device (refer to access control drawings and specifications)	---

END OF SECTION 08 71 00

SECTION 08 80 00 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Window walls.
2. Aluminum and Hollow Metal Doors.
3. Curtain walls.
4. Aluminum Entrances.
5. Interior borrowed lites and glazing
6. Storefront framing.

B. Refer to Section 08 44 13, “Glazed Aluminum Curtain Walls” for requirements applicable to single subcontract responsibility for glazing.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide and install watertight and airtight glazing systems capable of withstanding thermal movement and wind and impact loads without failure of any kind, including loss or breakage of glass, failure of seal or gaskets, exudation of glazing sealants, and excessive deterioration of glazing materials.

B. Glass Design: Glass thicknesses and heat treatments indicated are minimum requirements. Glazing details shown are for convenience of detailing only and are to be confirmed by the Contractor relative to cited standards and final framing details. Confirm glass thicknesses and heat treatments, verified by analysis, as required to meet the performance and testing requirements specified in Section 08 44 13, “Glazed Aluminum Curtain Walls”.

1.3 SUBMITTALS

A. Product Data: Submit product data for each glass product and glazing material indicated.

B. Glass Manufacturers Letter: The glass manufacturer shall submit a letter certifying that he has reviewed the glazing details proposed for the project, including the use of gaskets and sealants, and that each product to be furnished is recommended for the application shown.

C. Thermal Stress and Wind Load Analyses: Submit the following from the glass manufacturer:

1. Thermal stress analysis for each exterior glass unit type, each building elevation. The analysis shall clearly indicate all the expected service temperature ranges and the effects of partial and full shading on the glass. Append to the thermal stress analysis a statement

from the glass manufacturer that based upon this analysis that the resulting thermal stresses will not increase the specified "statistical probability of breakage".

2. Wind load analysis for each glass unit type, each building elevation. The analysis shall clearly indicate that the statistical probability of breakage at the design wind pressure will not exceed the specified statistical probability of breakage.

D. Samples: Label samples to indicate product, characteristics, and locations in the work. Furnish samples of the following:

1. Except for clear glass, submit samples of each glass type specified, in the form of 12-inch- (300-mm-) square Samples.
2. Submit samples of each glass type specified where production run variations, and defects are expected.
3. Submit glass samples with glass door and sidelight markings applied thereon.
4. Submit samples of applied film adhered to clear glass, in the form of 12” square samples.

E. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

F. Product Test Reports: Submit product test reports for each type of glazing sealant and gasket indicated.

G. Warranties: Submit special warranties specified in this Section. Copy of each proposed warranty shall be included with the Bidder’s Proposal.

H. Maintenance Instructions: Submit maintenance data for each applied glass film to be installed or applied; including recommendations and instructions for cleaning, maintenance, removal, and replacement of same.

I. LEED Submittals:

a. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
b. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

i. Include a statement indicating costs for each product having recycled content.

c. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

i. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

d. Product Data for Credit EQ 4.1: For glazing sealants used inside of the weatherproofing system, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for Project and whose work has resulted in construction with a record of successful in-service performance.

B. Source Limitations for Glass and Glass Accessories: Obtain glass and glass accessories from one source for each product indicated below:

1. Primary glass.
2. Coated glass.
3. Heat treated glass.
4. Insulating glass.
5. Glazing gaskets.

C. Safety Glass: Comply with the applicable requirements of the laws, codes, ordinances and regulations of Federal and Municipal authorities having jurisdiction, wherever requirements conflict the more stringent shall be required. Obtain approvals from all such authorities. As a minimum provide Category II materials complying with testing requirements in 16 CFR 1201 (Consumer Product Safety Commission “Safety Standard for Architectural Glazing Materials”, as published in the Code of Federal Regulations) and ANSI Z97.1.

D. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA'S "Glazing Manual."
2. IGMA Publications: IGMA TM-3000, "Vertical Glazing Guidelines."

E. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the Insulating Glass Certification Council (IGCC).

F. Mock-Ups: Refer to Section 08 44 13, ‘Glazed Aluminum Curtain Walls’ for requirements applicable to mock-ups.

G. Sample Installations: Refer to Section 08 44 13, ‘Glazed Aluminum Curtain Walls’ for requirements applicable to sample installations.

1. Representatives of glass and glazing materials manufacturers together with Contractor's field supervisor for glazing shall be present during construction, and field testing (if any), of sample installations.
2. Prepare sample installations where shown and as required to match approved shop drawings and the Contract Documents in all respects before proceeding with the work.
3. Accepted sample installations may remain as a portion of the completed work.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Deliver film to project site, and handle/store in accordance with manufacturer’s instructions, in unopened containers and in a manner that will ensure no deterioration of, or detrimental effects on, film and its system for adhering to glass. Protect from weather and physical abuse.

1.7 WARRANTY

A. Manufacturer's Special Warranty on Vertical Insulating Glass: Written warranty, made out to Owner and signed by insulating-glass manufacturer agreeing to furnish replacements for insulating-glass units that have failed within specified warranty period indicated below. Failure is defined as breakage from all other than “confirmed impact” and the obstruction of vision by dust, moisture, or film on interior surfaces of glass. Upon notification of such breakage or deterioration within the warranty period furnish replacement glass units for failed glass units at the convenience of the Owner.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Heat Soaked Tempered Glass Warranty: Submit a 5 year written warranty, beginning from date of substantial completion, and executed by the Contractor, manufacturer and the glass installer agreeing to replace glass units that spontaneously break as a result of Nickel Sulfide (NiS) inclusions within the specified warranty period without material or labor charges to the Owner.

PART 2 - PRODUCTS

2.1 PRODUCTS AND MANUFACTURERS

A. Refer to the drawings for the extent of glass types and locations. Glass types indicated on the drawings are keyed to the Part 3 Glass Schedule Article at the end of this section. The Contractor shall confirm the levels of heat treatment required for each glass type scheduled as contained in Articles Performance Requirements, Submittals and Quality Assurance.

2.3 HEAT-TREATED FLOAT GLASS

A. General: Heat treat glass where the need is determined by thermal stress analyses, by wind load analyses, and where required to meet safety glazing requirements.

B. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of installed glass unit.

C. Sizes and Cutting: Prior to heat treatment, cut glass to required sizes as determined by accurate measurement of openings to be glazed, making allowance for required edge clearances. Cut and process edges in accordance with glass manufacturer's recommendations. Do not cut or treat edges in the field.

D. Heat-Strengthened Glass: Provide glass complying with ASTM C1048 Kind HS. Surface compression range shall be between 4,000 psi (27.6 MPa) and 7,000 psi (48 MPa).

E. Fully Tempered Glass: Provide glass complying with ASTM C1048 Kind FT and meeting the requirements of ANSI Z97.1. Surface compression shall be equal to or greater than 10,000 psi (69 MPa). After tempering, expose 100% of all fabricated glass units to Viracon’s heat soaking process to eliminate inclusion related glass breakage and to obtain the specified warranty.

F. Flatness Tolerances: All heat treated glass shall be fabricated to the following flatness tolerances:

1. Overall Bow and Warp: Not greater than the maximum bow and warp tolerances in any direction as listed in ASTM C1048 Table 2. Localized warp limited to 1/32 inch in 12 inches (0.79 mm in 304.8 mm).
2. Roll Ripple: The deviation from flatness at any peak (peak to valley deviation) shall not exceed 0.003 inches for 6 mm (0.0762 mm for 6 mm) and thicker glass.

G. The appearance of anisotropy, also known as “leopard spots” and “quench patterns”, is known to be associated with tempered glass under certain polarized lighting conditions. This will not be considered a fault unless it is visible in a range of reasonably typical naturally occurring conditions. The Architect will determine the acceptable range(s) of anisotropy from glass sample submittals and thereafter from the exterior wall mock-ups and sample installations. Coatings applied to tempered glass products shall not exacerbate anisotropy to an unacceptable range(s).

2.6 INSULATING GLASS

A. Insulating-Glass Units: Preassembled units, with dehydrated entrapped air, consisting of sheets of glass hermetically sealed at all edges with a polyisobutylene primary and a black colored silicone secondary elastomeric sealant. The lites of glass shall be separated by dessicant containing black coated aluminum spacers. All insulating glass units shall be IGCC certified to comply with ASTM E 2190 and with requirements specified in this Article and in the Glass Schedule at the end of Part 3.

1. Provide Kind HS (heat-strengthened) float glass where needed to comply with "Performance Requirements" Article. Provide Kind FT (fully tempered) where safety glass is indicated.

B. Overall Unit Thickness: Overall unit thickness dimensions are indicated in the Glass Schedule at the end of Part 3 are nominal with the overall unit thickness measured perpendicularly from outer surfaces of glass lites at unit's edge.

C. Physical Property Performance Values for Insulating Glass Units

G-01

Visible Light Transmittance:	**38%**
Winter Nighttime U-Value:	**.30**
Summer Daytime U-Value:	**.27**
Solar Heat Gain Coefficient:	**.25**
Shading Coefficient:	**.29**

G-02

Visible Light Transmittance:	**75%**
Winter Nighttime U-Value:	**.30**
Summer Daytime U-Value:	**.26**
Solar Heat Gain Coefficient:	**.40**
Shading Coefficient:	**.46**

G-03

Visible Light Transmittance:	**30%**
Winter Nighttime U-Value:	**.29**
Summer Daytime U-Value:	**.26**
Solar Heat Gain Coefficient:	**.19**
Shading Coefficient:	**.22**

2.7 GLAZING SEALANTS

A. Gasket, Blocking, and Wet Glazing Materials: Silicone, compatible with and adherent to each material it will be in contact with, as recommended by the manufacturer to fulfill performance requirements.

2.8 GLAZING GASKETS

A. Dense Compression Gaskets: Continuous extruded silicone with cross sectional profile, physical properties, and tolerances as recommended by the window and curtain wall manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C1115, Type C.

B. Soft Compression Gaskets: Continuous extruded expanded foam with, cross sectional profile, physical properties, and tolerances as recommended by the window and curtain wall manufacturer, and as required, to comply with the performance requirements specified and shown all in compliance with the applicable provisions of ASTM C509, Option II, Type II; provide the following:

1. Silicone.

2.9 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces, and wet glazing materials, contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 85 +/- 5 Shore A durometer hardness, 1/16 inch (1.5-mm) less than the channel width, and length based on the square footage of the glass unit to be supported in accordance with GANA standards and glass manufacturer recommendations but not less than 4 inches (101.6 mm).

D. Edge Blocks: Silicone complying with ASTM C1115 (Type C), blocks, 65 +/- 5 Shore A durometer hardness, minimum 4 inches (101.6 mm) long and sized to allow 1/8 inch (3.18 mm) clearance between edge of glass and block.

E. Door and Sidelight Markings: Provide safety markings as required by the Jetport at doors and sidelights. If not otherwise shown on the drawings, the markings shall be acceptable to the Architect and the local authorities having jurisdiction. Apply markings using permanent chemical etching or sandblasting methods recommended by the manufacturer at location(s), and in pattern(s), at each glass door and sidelight as accepted through sample submittal and shop drawing submissions.

F. Applied Translucent and One-Way Films: A water resistant, permanent, glossy, 2 mil thick vinyl film laminated to a clear pressure sensitive adhesive and transparent synthetic liner, having an overall thickness of between 2.5 to 3.6 mils; a minimum tensile strength of 5 pound/inch, an applied shrinkage of 0.010”, and a service temperature range of –40 to +225 degrees F.

1. Manufacturer and Product: 3M; Scotchcal Electrocut Graphic Film Series – in color , translucency and pattern selected by Architect’s from full range in manufacturer's series.

2.10 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing standard, to comply with system performance requirements.

1. Edge and Surface Conditions: Comply with the recommendations of AAMA "Structural Properties of Glass" for "clean-cut" edges, except comply with manufacturer's recommendations when they are at variance therewith.

B. Cutting: Do not nip glass edges. Edges may be wheel cut or sawed and seamed at manufacturer's option. For glass to be cut at site, provide glass 2 inches (50.8 mm) larger than required in both dimensions, so as to facilitate cutting of clean cut edges without the necessity of seaming or nipping. Do not cut, seam, nip or abrade heat-treated glass.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier and glass framing erector present, for compliance with the following:

1. Compliance with the specified manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing stops, glazing channels, and rabbets which will be in contact with the glazing materials immediately before glazing. Loose particles present or resulting from fabrication and cleaning shall be removed by blowing out joints with oil free compressed air, or by vacuuming joints. . Remove protective coatings, oils from cutting and drilling operations, and residue on metallic surfaces with solvents that leave no residue. Do not allow solvent to air dry without wiping. Use only lint free towels for wiping of surfaces. Wipe metal surfaces with IPA (isopropyl alcohal) unless otherwise required by compatibility and adhesion testing results.

1. Prime surfaces to receive glazing compounds. When priming, comply with wet glazing manufacturers recommendations.

B. Inspect each piece of glass immediately before installation. Do not install any pieces which are improperly sized or have damaged edges, scratches or abrasion or other evidence of damage. Remove labels from glass immediately after installation.

C. Substrate Preparation for Applied Film: Clean glass surfaces to receive the application of applied film. Remove foreign deposits, including paint spatter and glazing sealant materials that have migrated from glazing channel. Wash with detergent, rinse, and dry each glass surface immediately prior to film application; comply with film manufacturer's instructions and recommendations. Control and limit unnecessary activities, occupancies, air movements, and similar incidents in each space of the building during the time of cleaning and film application; so as to ensure the best possible environment for application of film on clean substrates. Comply with environmental conditions as recommended by film manufacturer prior to applying film to glass.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

1. All glass units shall be installed in accordance with the glass manufacturers recommendations.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to surfaces indicated to receive glazing materials. Use primers as determined by preconstruction compatibility and adhesion testing.

E. Install setting blocks in sill rebates, sized and located to comply with referenced glazing publications, unless more stringent requirements are recommended by glass manufacturer. Place blocks to allow water passage to weep holes. Set blocks in thin course of silicone sealant.

1. For Glass Units Less Than 72 inches (1830 mm): Locate setting blocks at sill one-quarter of the width in from each end of the glass unless otherwise recommended by the glass manufacturer.
2. For Glass Units 72 inches (1830 mm) or Greater: Locate setting blocks at sill one-eighth of the width in from each end of the glass, but not less than 6 inches (150 mm), unless otherwise recommended by the glass manufacturer.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide edge blocking to prevent glass lites from moving sideways in glazing channel, sized and located to comply with the glass manufacturers recommendations and the requirements in referenced glazing publications.

H. Set glass lites with uniform pattern, draw, bow, and similar characteristics, producing the greatest possible degree of uniformity in appearance on the entire exterior wall elevation.

1. Set glass units with void between edge of units and glazing channel.
2. Orient and install insulating glass units made up with one light of low emissivity coated glass with the uncoated glass light on the inboard (building) side.

I. Where wedge-shaped gaskets are driven into one side of channel to pressurize gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

J. Miter cut gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away and join with sealant recommended by gasket manufacturer which will provide an airtight and watertight seal at the joint.

K. Film Application: Comply with film manufacturer's installation requirements, instructions, and recommendations. Avoid seams whenever possible and, where not possible, minimize the number of seams. Produce seams which are tightly-butted; without overlaps and gaps which are

visible only at viewing distances of 20 inches and less. Apply film by method which will ensure the inclusion of no air bubbles or other foreign substances.

1. Extend film to cover full expanse of each glass sheet to receive film; but without either overlapping the glass glazing materials, or leaving edge gaps of more than 1/32 inch.

2. In order to minimize the possibility of visible differences in the color or shading intensity of the butted films at seams, apply each film with its butted edge taken from the same end of the film roll (reverse the direction-of-application). Remove and replace film application where mismatching of films is visually noticeable where directed by Architect.

3. Exercise extreme care during application of film, including the cutting and pressing-in-place of film, so as to avoid the scoring and abrading of surfaces of glass.

4. Adhere film to glass, using procedures recommended by film manufacturer. Press into place to ensure that entire film sheet, including edges, are firmly and permanently adhered.

3.4 PROTECTION AND CLEANING

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged and from sources such as natural causes, accidents, and vandalism.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass and film as recommended by glass and film manufacturers.

3.5 EXTERIOR WALL GLASS SCHEDULE

A. G-01: 1” insulating unit; class 1 (clear) 6 mm thick low emissivity coated glass outboard lite with low emissivity coating located on the #2 surface, a ½” aluminum spacer, and class 1 (clear) 6 mm thick inboard lite.

1. Product and Manufacturer: VNE1-37 Insulating , Viracon.

B. G-02: 1” insulating unit; class 1, low iron (Starphire) 6 mm thick low emissivity coated glass outboard lite with low emissivity coating located on the #2 surface, a ½” aluminum spacer, and class 1 low iron (Starphire) 6 mm thick inboard lite.

1. Product and Manufacturer: VE13-2M Insulating , Viracon.

C. G-03: 1” insulating unit; class 2 (Gray) 6 mm thick low emissivity coated glass outboard lite with low emissivity coating located on the #2 surface, a ½” aluminum spacer, and class 1 (Clear) 6 mm thick inboard lite.

1. Product and Manufacturer: VNE3-63 Insulating , Viracon.

D. G-04: 1” insulating unit with 6mm glass; see finish schedule for glass surface coatings.

1. Product and Manufacturer: VNE3-63 Insulating , Viracon.

3.6 INTERIOR GLASS SCHEDULE (refer to Finish Materials Schedule drawing for applied films)

A. IG-01: See section 08 83 00 MIRRORS

B. IG-02: Uncoated, clear fully tempered float glass, Kind FT (fully tempered); 5/8” thick unless otherwise indicated. With applied film per finish schedule

C. IG-03: Uncoated, clear fully tempered float glass, Kind FT (fully tempered); 5/8” thick unless otherwise indicated.

E. IG-04: Uncoated, clear fully tempered float glass, Kind FT (fully tempered); 5/8” thick unless otherwise indicated.With applied film per finish schedule

END OF SECTION 08 80 00

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes the following types of silvered flat glass mirrors:

1. Annealed monolithic glass mirrors.
2. Tempered glass mirrors qualifying as safety glazing.

1.2 SUBMITTALS

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

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches (300 mm) long.

D. Preconstruction test reports.

E. Maintenance data.

F. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Glazing Publications: Comply with GANA's "Glazing Manual" and "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

B. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

C. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing and substrates on which mirrors are installed.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is

defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Glass Mirrors, General: ASTM C 1503; manufactured using copper-free, low-lead mirror coating process.

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. Arch Aluminum & Glass Co., Inc.
b. Avalon Glass and Mirror Company.
c. Binswanger Mirror; a division of Vitro America, Inc.
d. D & W Incorporated
e. Donisi Mirror Company.
f. Gardner Glass, Inc.
g. Gilded Mirrors, Inc.
h. Guardian Industries.
i. Head West.
j. Independent Mirror Industries, Inc.
k. Lenoir Mirror Company.
l. Maran-Wurzell Glass & Mirror.
m. National Glass Industries.
n. Stroupe Mirror Co., Inc.
o. Sunshine Mirror; Westshore Glass Corp.
p. Virginia Mirror Company, Inc.
q. Walker Glass Co., Ltd.

B. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Approved by mirror manufacturer.

2.3 MIRROR HARDWARE

A. Top and Bottom Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Finish: Clear bright anodized.

B. Mirror Bottom Clips: As indicated.

C. Mirror Top Clips: As indicated.

D. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

E. Anchors and Inserts: Provide devices as required for mirror hardware installation.

2.4 FABRICATION

A. Mirror Edge Treatment: Flat polished. Seal edges of mirrors with edge sealer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

B. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

C. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

D. Wall-Mounted Mirrors: Install mirrors with mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

E. Protect mirrors from breakage and contaminating substances resulting from construction operations.

F. Do not permit edges of mirrors to be exposed to standing water.

G. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

H. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

END OF SECTION 08 83 00

SECTION 08 91 00 – LOUVERS AND VENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Fixed, extruded-aluminum louvers and blank-off panels for wall louvers.

B. Single Source Responsibilities: Refer to Section 08 44 13 , “Glazed Aluminum Curtain Walls” for the requirements of single source responsibilities for louvers.

1.2 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

1.3 PERFORMANCE REQUIREMENTS

A. Refer to Section 08 44 13 , “Glazed Aluminum Curtain Walls, Article 'Performance Requirements'.

1.4 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Shop Drawings: Submit shop drawings for louvers and accessories. Include plans, elevations, sections, details, showing blade profiles, angles, and spacing of louver blades; unit dimensions related to wall openings and construction; free areas for each size indicated; profiles of frames at jambs, heads, and sills; and anchorage details and locations.

C. Samples: Submit sets of samples for each finish and color required. Sample finishes shall be on the specified alloy temper, and thickness of metal required for the work; on 12" lengths of extrusion or 12" squares of sheet or plate sets; and shall show the maximum range or variation in color and shade, in not less than 4 samples per set.

D. Product Test Reports: Submit product test reports and certifications evidencing compliance of units with requirements indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers through one source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Qualify welding processes and welding operators in accordance with D1.2 "Structural Welding Code – Aluminum."

1. Certify that each welder employed in unit of Work of this section has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

2. Testing for recertification is Contractor's responsibility.

1.6 WARRANTY

A. Warranty for Louvers located in the Exterior Wall: A 5 year warranty is required for all louver work located in the exterior wall, refer to Section 08 44 13 , Glazed Aluminum Curtain Walls, Article 'Warranty'.

B. Warranty, High Performance Organic Coatings: Refer to Section 08 44 13 , Glazed Aluminum Curtain Walls, Article 'Warranty'.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delay of the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 IDENTIFICATION, DELIVERY, STORAGE, AND HANDLING

A. Refer to Section 08 44 13 , Glazed Aluminum Curtain Walls

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Components: Refer to Section 08 44 13 , Glazed Aluminum Curtain Walls.

B. Carbon Steel: For carbon steel components required to join, reinforce or support the assembly of aluminum components provide carbon steel conforming to ASTM A 36/A 36M for structural shapes, plates, and bars; ASTM A 1008/A 1008M for cold-rolled sheet and strip; or ASTM A 1011/A 1011M for hot-rolled sheet and strip.

C. Fasteners: 300 Series stainless steel. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, with color to match adjacent surfaces.

D. Postinstalled Fasteners for Concrete: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

E. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. General: Provide louvers and accessories of design, materials, sizes, depth, arrangement shown and metal thicknesses specified and as required for optimum performance with respect to airflow, water penetration, air leakage, durability, structural integrity, expansion and contraction control, and uniform appearance.

B. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

C. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Conceal supporting framework from vision on outside face of louver by placing braces, mullions and brackets on inside face; with close filling, field-made splice joints in blades designed to permit expansion and contraction without deforming blades or framework.

G. Provide subsills and extended sills made of same material as louvers for drainage to exterior and to prevent water penetrating to interior.

H. Join frame members to each other and to fixed louver blades with fillet welds concealed from view, unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

I. Join frame members to each other and to fixed louver blades with concealed fillet welds, except where size of louver assembly makes bolted connections between frame members necessary.

2.3 FIXED, EXTRUDED-ALUMINUM LOUVERS

A. Horizontal, Continuous-Line, Drainable-Blade Louver: Drainable-blade louver with blade gutters (drains) in rear two-thirds of blades only and with mullions capable of collecting and draining water from blades.

1. Louver Depth: 6 inches (150 mm).
2. Frame and Blade Nominal Thickness: As required to comply with structural performance requirements, but not less than 0.080 inch (2.0 mm).
3. Blade Angle: 35 degrees.
4. Performance Requirements: Refer to Section 08 44 13 , Glazed Aluminum Curtain Walls.

2.4 LOUVER SCREENS

A. General: Provide screen at each exterior louver with removable louver screens sized to cover the entire opening, except where required for blankoff panels, complying with the following requirements:

1. Screen Location for Fixed Louvers: Interior face.
2. Screening Type: Bird screening.

B. Secure screens in a manner to prevent rattle of the frame and mesh to louver frames using stainless-steel machine screws, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated and to comply with the following requirements:

1. Metal: Formed or extruded aluminum. Reinforce extruded-aluminum screen frames at corners with clips.
2. Finish: Same finish as louver frames to which louver screens are attached.
3. Type: Rewirable frames with a driven spline or insert for securing screen mesh.

D. Louver Screening for Aluminum Louvers: Fit aluminum louver screen frames with screening covering louver screen opening and complying with the following requirements:

1. Bird Screening: Aluminum, 1/2-inch- (12.7-mm-) square mesh, 0.063-inch (1.6-mm) wire.

2.5 ALUMINUM FINISHES

A. General: Comply with the requirements of Section 08 44 13 , Glazed Aluminum Curtain Walls.

1. Finish louvers after assembly.

B. Touch-Up Finish: Polyvinylidene fluoride finish coating, containing fluorocarbon resin and formulated for air-drying at ambient temperature. Provide for field touch-up and furnish in color to match shop-applied finishes.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION

A. General: Refer to Section 08 44 13 , Glazed Aluminum Curtain Walls.

B. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.

C. Use concealed anchorages where possible. Provide neoprene washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

D. Form closely fitted joints with exposed connections accurately located and secured.

E. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

F. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

H. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 "Joint Sealants" for sealants applied during louver installation.

3.3 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection remove temporary coverings (if any) and clean exposed surfaces using materials and methods recommended by the metal finish manufacturer which are not harmful to finishes or cause unevenness as a result of unequal exposure to light and weathering conditions.

C. Restore louvers damaged during installation and construction period so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 91 00

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 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 suspension systems (e.g., supports for ceilings, suspended soffits, etc.).

1.2 SUBMITTALS

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

B. Submittals for LEED-NC:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Credit MR 4.1, Recycled Content: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include a statement indicating costs for each product having recycled content.
3. Credit MR 5.1, Local/Regional Materials: Product Data indicating location of material manufacturer and point of extraction for regionally extracted, processed, and manufactured materials.

    a. If only a fraction of the material is extracted and manufactured locally, indicate the percentage by weight.
    b. Include a printed statement of cost for each regionally extracted, processed, and manufactured material.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. Sound Transmission Characteristics: For STC-rated assemblies that incorporate non-load-bearing steel framing, 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-LOAD-BEARING STEEL 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: manufacturer's standard corrosion-resistant zinc coating, unless otherwise indicated.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.

a. Type: Postinstalled, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch (4.12-mm) diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25.4 by 4.76 mm) by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538 inch (1.37 mm) and minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: As indicated on Drawings.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges, 3/4 inch (19.1 mm) deep.
2. Steel Studs: ASTM C 645.

a. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).
b. Depth: As indicated on Drawings.

3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22.2 mm) deep.

a. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).

4. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep members designed to reduce sound transmission.

a. Configuration: Asymmetrical or hat shaped.

G. Grid Suspension System for Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
2. Products: Subject to compliance with requirements, provide one of the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Furring System.
c. USG Corporation; Drywall Suspension System.
d.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).

B. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (50.8-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. 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. 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) Steel Network Inc. (The); VertiClip SLD Series.
2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Track: As specified in Division 07 Section "Fire-Resistive Joint Systems."

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0312 inch (0.79 mm).

E. Cold-Rolled Channel Bridging: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38.1 by 38.1 mm), 0.068-inch- (1.73-mm-) thick, galvanized steel.

F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0312 inch (0.79 mm).
2. Depth: As indicated on Drawings.

G. Resilient Furring Channels: 1/2-inch- (12.7-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

H. Cold-Rolled Furring Channels: 0.0538-inch (1.37-mm) bare-steel thickness, with minimum 1/2-inch- (12.7-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum bare-steel thickness of 0.0312 inch (0.79 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch- (1.59-mm-) diameter wire, or double strand of 0.0475-inch- (1.21-mm-) diameter wire.

I. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (31.8 mm), wall attachment flange of 7/8 inch (22.2 mm), minimum bare-metal thickness of 0.0179 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. 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. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.
   1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

3.2 INSTALLING SUSPENSION SYSTEMS

A. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

B. Suspend hangers from building structure as follows:

   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

   3. Do not attach hangers to steel roof deck.
   4. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   5. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   6. Do not connect or suspend steel framing from ducts, pipes, or conduit.

C. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

D. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

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 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 (12.7-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    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. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches (150 mm) o.c.

C. Direct Furring:
1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

D. Z-Furring Members:

1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (600 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (300 mm) from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Exterior glass-mat gypsum board wall sheathing.
4. Tile backing panels.

1.2 SUBMITTALS

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

B. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

C. Submittals for LEED-NC:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.1: For adhesives used to laminate gypsum board panels to substrates, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. 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.

C. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.
b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 Recycled Content: Provide gypsum panel products with recycled content such that post-consumer recycled content plus one-half of pre-consumer recycled content constitutes a minimum of 40 percent by weight.

2.2 EXTERIOR GYPSUM BOARD WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corporation; GlasRoc.
b. G-P Gypsum Corporation; Dens-Glass Gold.
c. Temple-Inland Inc.; GreenGlass
d. United States Gypsum Co.; Securock.

2. Type and Thickness: Regular, 1/2 inch (13 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm)

2.3 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: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

C. Type X:

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.

2.4 TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M or ASTM C 1396/C 1396M.

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. Glass-Mat, Water-Resistant Backing Board:

1. Complying with ASTM C 1178/C 1178M.

a. Product: Subject to compliance with requirements, provide "DensShield Tile Guard" by G-P Gypsum.

2. Complying with ASTM C1177/C 1177M.

a. Product: Subject to compliance with requirements, provide "DensArmor Plus Interior Guard" by G-P Gypsum.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
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.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

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. Fry Reglet Corp.
b. Gordon, Inc.
c. Pittcon Industries.

3. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

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 drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.
2. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
3. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

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

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. 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 (0.84 to 2.84 mm) thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.
2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

F. Acoustical Sealant: As specified in Division 07 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).

G. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

H. Combination Water Barrier/Air Barrier/Vapor Retarder: As specified in Division 07 Section "Self-adhering sheet waterproofing"

2.8 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches (50 mm) wide, 10 by 10 or 10 by 20 threads/inch (390 by 390 or 390 by 780 threads/m), of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) 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.

D. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members, or provide control joints to counteract wood shrinkage.

3.2 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Regular Type: Vertical surfaces, unless otherwise indicated.
2. Type X: Where required for fire-resistance-rated assembly.
3. Ceiling Type: Ceiling surfaces.
4. Moisture- and Mold-Resistant Type: As indicated on Drawings.

3.3 APPLYING TILE BACKING PANELS

A. Water-Resistant Gypsum Backing Board: Install at showers, tubs, and where indicated. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

B. Glass-Mat, Water-Resistant Backing Panel: Comply with manufacturer's written installation instructions and install at locations indicated to receive tile. Install with 1/4-inch (6.4-mm) gap where panels abut other construction or penetrations.

C. Areas Not Subject to Wetting: Install regular-type gypsum wallboard panels to produce a flat surface except at showers, tubs, and other locations indicated to receive water-resistant panels.

D. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.4 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 Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.

5. U-Bead: Use at exposed panel edges.
6. Curved-Edge Cornerbead: Use at curved openings.

D. Exterior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at exposed panel edges.

E. Aluminum Trim: Install in locations indicated on Drawings.

3.5 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.
1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.
1. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and 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:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 3: Where indicated on Drawings.
4. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Glass-Mat, Water-Resistant Backing Panels: Finish according to manufacturer's written instructions.

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 09 29 00

SECTION 09 31 13 – THIN SET CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes man made tile indicated on the drawings with the prefix “CT" and transition/divider strips for related sections 03 30 00 CAST IN PLACE CONCRETE and 03 36 00 SPECIAL CONCRETE FINISHES (POLISHED CONCRETE)

1.2 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: Provide floor tile products with a minimum 0.6 value as determined by testing identical products per ASTM C 1028 under a wet and dry condition.

1.3 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Samples: Submit samples showing full range of color and texture variations expected.

1. Full-size units of each type, color and finish required.

2. Grout samples, at least 12 inches long, each type and color indicated.

3. Full-size units of each type of trim and accessory for each color and finish required.

C. Test Reports: Submit test reports from qualified independent testing laboratory indicating and interpreting test results relative to compliance of tile products with requirements specified for slip resistance.

D. Maintenance instructions: Submit maintenance instructions for each type of product specified.

1.4 QUALITY ASSURANCE

A. Installer: Engage an installer, with a minimum of 5 years of successful commercial tile installations similar in material, design, and scope to that indicated.

B. Source Limitations for Tile: Obtain tile from one source or producer, and from same production run and of consistent quality in appearance and physical properties for each contiguous area.

C. Field-Constructed Sample Installations: Before installing tile, erect sample installations for each form of construction and finish required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build sample installations to comply with the following requirements, using materials indicated for final unit of Work.

1. Locate sample installations on site, in locations and size indicated or, if not shown or indicated, as directed by Architect but not less than 100 square foot area for floors, and not less than 100 square foot area for walls.

2. Retain and maintain sample installations during construction in undisturbed condition as a standard for judging completed unit of Work.

3. Approved sample installations may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

B. Maintain temperatures at 50°F or more in tiled areas during installation and for 7 days after completion, unless higher temperatures are required by referenced installation standard or manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide ceramic tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements, unless otherwise indicated.

2.2 TILE PRODUCTS

A. Floor and Wall Tile: Provide ceramic tiles matching the Architect’s samples which have been selected from the following product lines and manufacturers:

1. Floor and Wall Tile (CT-01 through CT-6): Refer to Finish Materials Schedule drawing

B. Tile Trim Units: Matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:

1. All Outside and Inside Wall Corners: Schluter Systems -DILEX-EHK stainless steel trim

2.3 WATERPROOFING FOR THIN-SET TILE INSTALLATIONS

A. Typical Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber, with a fabric reinforcement compatible with mortar bed specified and complying with ANSI A118.10; one of the following:

1. MAPEI Corporation; PRP M19.

2. LATICRETE International Inc.; Laticrete 9235 Waterproof Membrane.

3. Custom Building Products; Trowel & Seal Waterproofing and Anti-Fracture Membrane.

2.4 SETTING AND GROUTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Wall Tile: Prepackaged dry-mortar mix combined with acrylic resin or styrene-butadiene-rubber liquid-latex additive.

a. For wall applications, provide nonsagging mortar that complies with Paragraph F-4.6.1 in addition to the other requirements in ANSI A118.4.

B. Polymer-Modified Tile Grout: Complying with ANSI A118.6 and the following:

1. Either Acrylic resin or styrene-butadiene rubber in liquid-latex form for addition to prepackaged dry-grout mix; or, ethylene vinyl acetate, in dry, redispersible form, prepackaged with other dry ingredients to which only water must be added at Project site. Colors to match Architect’s samples of the following:

a. Floor Tile Grout Color: Mapei;, sanded grout. Color selected by Architect from full manufacturers range

b. Wall Tile Grout Color: Mapei;, non-sanded grout. Color selected by Architect from full manufacturers range

2.5 ELASTOMERIC SEALANTS

A. Sealants Used for Tile Work: ‘Silicone Sanitary Sealant’ as specified under Section 07 92 00 "Joint Sealants."

2.6 MISCELLANEOUS MATERIALS

A. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

B. Metal Thresholds and Transition Strips: Mill finished, extruded aluminum types, profiles as indicated.

C. Grout Sealer: Grout manufacturer's recommended silicone product for sealing grout joints that does not change color or appearance of grout.

D. Heavy-Top Divider/Transition Strips: Angle type in depth required for topping thickness indicated.
   1. Top-Section Material: White zinc alloy.
   2. Top-Section Width: 1/4 inch (6.4 mm).

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions. Add materials and liquid latex additives in accurate proportions. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 PREINSTALLATION MEETING

A. Prior to the installation of tile, and at the Contractor's direction, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work. The meeting shall include the Owner, Architect, the Contractor, tile installer, tile and setting material manufacturer's representatives, and representatives of other trades or subcontractors affected by the installation.

3.2 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present.

   1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds. Grind concrete substrates to remove films, sealing and curing compounds if they are determined to be present on the substrate.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.3 PREPARATION

A. Remove paint, coatings, including curing compounds and other substances that are incompatible with tile-setting materials.

B. Blending: Blend tiles for color blending at Project site before installing.

1. Furnish the same lots, batches, etc. within the same contiguous areas of the site (i.e. corridors on the same floors, common rooms which adjoin each other, etc.).

3.4 INSTALLATION, GENERAL

A. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

B. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

C. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area beginning at thresholds and transition strips. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.

2. Layout the work using full sized, uncut tiles, beginning at toilet room thresholds and transition strips.

D. Expansion Joints: Locate sealant filled expansion joints where recommended by the manufacturers of mortar and tile materials but not less than the requirements of TCA EJ171, and as accepted by the Architect. Form joints during installation of setting materials, mortar beds, and tile. Do not saw cut joints after installation of tiles.

1. Prepare joints and apply sealants to comply with requirements in Division 7 Section "Joint Sealants."

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and waterproofing manufacturer's written instructions to produce waterproof membrane of uniform thickness bonded securely to substrate.

1. Prohibit foot and wheel traffic on waterproofed floors for time period as recommended by the manufacturer.

B. Do not install tile over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 FLOOR TILE INSTALLATION

A. Thinset Tile over Waterproof Membrane: Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of subfloor construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Mortar: Latex-Portland Cement Mortar: ANSI A108.5.

2. Concrete Subfloors, Interior: TCA F122.

   a. Apply the mortar to waterproofed slab with the flat side of the trowel.
   b. With a trowel, having notches sized as recommended by the mortar manufacturer, comb the surface of the mortar with the notched side of the trowel removing excess mortar. Spread only as much mortar as can be covered in the time limits established by the mortar manufacturers recommendations.
   c. Wipe the back of each tile, with a damp sponge, to remove all dust or dirt immediately before applying mortar to tiles.
   d. Immediately after wiping tile backs, but prior to placing tile, the mortar shall be troweled to back of tile for 100% coverage to thickness of not less than 1/16".
   e. Place tiles onto mortar bed, maintaining 1/8" wide joints, and true accurate pattern as shown. Exercise care to quickly remove spillage from faces of tile using water.
   f. Prohibit foot and wheel traffic on tiled floors for period of time as recommended by the mortar manufacturer.

3. Grout Installation, Latex-portland cement: ANSI A108.10.

4. Grout Sealer: Apply grout sealer to cementitious grout joints in the public toilet rooms, as required by the Port Authority, according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

B. Metal Thresholds and Transition Strips: Install at locations indicated or where exposed edge of tile flooring meets carpet, terrazzo, resilient, or other flooring. Install thresholds and transition strips in one piece, notched to fit neatly at jambs. Thresholds and transition strips shall be secured with fasteners secured to floor substrates at a maximum spacing of 12 inches (305 mm) o.c. Minimum screw size shall be No. 10 length, dependent on job conditions, with a minimum of 3/4 inch (19 mm) thread engagement into the floor or anchoring device used. Screw heads to be countersunk and flush with face of threshold and transition strip.

3.7 WALL TILE INSTALLATION

A. Install in accordance with the mortar manufacturer's recommendations and requirements indicated below for ANSI setting bed methods, TCA installation methods related to types of construction, and grout ANSI installation methods and grout types. Where recommendations and methods conflict, the manufacturer's recommendations shall apply.

1. Latex Portland Cement Mortar Installation (using specified latex portland cement mortar material): ANSI A108.5.

2. Gypsum Wallboard, Interior (Latex Portland Cement Mortar) Method: TCA W243, except place tiles maintaining 1/8" wide joints, and true accurate pattern as shown.

3. Grout Installation, Latex-portland cement: ANSI A108.10.

4. Grout Sealer: Apply grout sealer to cementitious grout joints to a point 48 inches above the finished floor in the public toilet rooms, as required by the Port Authority, according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer that has gotten on tile faces by wiping with soft cloth.

3.8 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. When recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.

D. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

END OF SECTION 09 31 13

SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes acoustical panel ceilings.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Shop Drawings: Submit shop drawings of reflected ceiling plans drawn accurately to large scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Patterns of ceiling suspension system members with setting out/work points.
2. Method of attaching suspension system hangers to building structure.
3. Ceiling-mounted items including light fixtures; air outlets and inlets; speakers; sprinklers; and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.

C. Samples: Submit samples for each component indicated and for each exposed finish required, prepared on Samples of size indicated below. Samples shall show the full range of color and texture variations to be expected in the final installation.

1. Acoustical Panel: Set of 6-inch- square 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.

D. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.1: For sealants, including printed statement of VOC content.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an Installer, with not less than 5 years experience in the installation of materials specified, and who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

C. Performance Requirements: In areas where gypsum wallboard partitions are dependent on the ceiling suspension system for lateral support, design and install suspension system components to sustain the imposed load from the completed partition system including a minimum inward and outward pressure of 5 psf normal to the plane of the wall.

D. Sample Installations: Before installing acoustical panel ceilings, install sample installations, for each type of acoustical panel ceiling installation required to demonstrate aesthetic effects and qualities of materials and execution. The sample installation shall be complete in every way and include all attachments to structure, hangers, grids, ceiling panels, moldings and column trims, light fixtures, air outlets and inlets; speakers, sprinklers heads, heat and smoke detectors. Install sample installations to comply with the following requirements, using materials indicated for the completed Work:

1. Size and Location: Provide 250 square foot sample installations in locations as directed by Architect.
2. Demonstrate the proposed range of aesthetic effects and workmanship.
3. Obtain Architect's approval of sample installations before starting work.
4. Maintain sample installations during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approved sample installations may become part of the completed Work if undamaged at time of Substantial Completion.

1.4 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.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install acoustical panel ceilings until wet work (painting, drywall, interior tilework, and concrete leveling) 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.

1.6 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.

1.7 EXTRA STOCK

A. Furnish and store at the site where directed, 2% of each type of acoustic panel installed in the Project, packaged in manufacturer's unopened cartons and identified as to contents.

PART 2 - PRODUCTS

2.1 ACOUSTICAL TILES: See Finish Materials Schedule drawing for additional information.

A. ACT-01:

1. Manufacturers and Products:

a. Armstrong, Optima Plank Square Tegular

2. Size: 24” x 96”.

3. Thickness: 1”.

B. ACT-02:

1. Manufacturers and Products:

a. Armstrong; Ultima Beveled Tegular 15/16"

2. Size: 24” x 24”.

3. Thickness: 3/4"

C. ACT-03:

1. Manufacturers and Products:

a. Armstrong; Optima Open Plan

2. Size: 48” x 48”.

3. Thickness: As required by the acoustical manufacturer for the application(s) indicated.

2.2 METAL SUSPENSION SYSTEMS

A. 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 and Referenced Standard RS 5-16.

B. Hanger Attachments to Overhead Decks: Suitable for application indicated, fabricated from corrosion resistant materials, with clips, or other devices for attaching hangers and capable of sustaining, without failure, a load equal to 10 times the design load indicated in ASTM C635, Table 1, Direct Hung.

1. Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).

C. Hangers: Each hanger shall be capable of carrying all loads suspended therefrom plus an additional 200 pounds located at midspan per RS 5-16. As follows:

1. Wire Ties for Hangers: Provide wires complying with the following requirements:

a. Zinc-Coated Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
b. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 12 ga. diameter for hanger wire.

2. Hanger Rods: ASTM A510, mild carbon steel.

a. Diameter: ¼-inch.
b. Protective Coating: ASTM A153/A153M, hot dip galvanized.

3. Flat Hangers: Commercial-sheet steel, ASTM A653/A653M, G60, hot dip galvanized.

a. Size: 1 by 3/16 inch by length indicated.

D. Carrying Channels: Each carrying channel shall have a midspan deflection, as calculated, not exceeding 1/360 of the span between hanger supports attached thereto. The connections of the carrying channel to the hangers shall be adequate for the load supported by the carrying channel plus 200 pounds per RS 5-16. Fabricate carrying channels from ASTM C754, cold rolled steel channels, 1-1/2", 475 lbs. Per 1000 linear ft.

E. Moldings and Trim Accessories: Manufacturers standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems specified; provide in longest standard single piece lengths.

1. F Moldings: Provide F moldings at ceiling breaks, soffits, bulkheads, and changes in elevation other than vertical walls and columns to the extent indicated. Form from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

2. Metal Perimeter Channel Trim: Shapes and profiles to suit conditions indicated; fabricated from extruded aluminum; finished to match exposed flanges of suspension system runners. Provide manufacturers recommended tee-bar connection clips, and hanging clips, which lock into specially designed bosses on the channel trim and are screw attached to the web of the intersecting suspension system members. Join sections of trim together with manufacturers standard splice plates and alignment clips.

    a. Armstrong; Axiom.

    b. Chicago Metallic Corp.; Infinity.

    c. USG; Compasso.

F. Clips: Provide support clips, clamps, fasteners, splines, and other attachment devices as required to align components and to connect components and transfer imposed loads of suspension system.

1. Provide partition attachment clips, and fasteners for areas where partition ceiling runners are secured to the ceiling suspension system.
2. Provide attachment clips for runner to angle molding to avoid use of pop rivets.
3. Provide grid converter accessories as required to change main tee direction 90 degrees from adjacent main tee.
4. Provide light fixture clips.
5. Provide hold down clips at entryways to reduce flutter as required.
6. Provide miter closure clips.

G. Suspension System:

1. Wide-Face, Capped, Double-Web, Steel Suspension System (ACT-70 and ACT-71): Main and cross runners roll formed from hot dip galvanized coated, cold-rolled steel sheet, with prefinished baked on enamel finished min 15/16" wide metal caps on flanges, (unless noted otherwise on Finish Materials Schedule drawing) other characteristics as follows:

    a. Face Design: Flush capped faces.
    b. Structural Classification: Intermediate-duty system.
    c. Cap Material and Finish: Steel sheet painted to match color of acoustical panel.
    d. Manufacturers and Products:

        1) Armstrong; 15/16” Prelude Exposed Tee Grid.
        2) USG; DX Grid.
        3) Chicago Metallic Corp.; 1200 System.

2. Narrow-Face, Uncapped, Double-Web, Steel Suspension System (ACT-50, ACT-51): Main and cross runners roll formed from hot dip galvanized coated, cold-rolled steel sheet, with prefinished baked on enamel finished 9/16" wide faces; other characteristics as follows:

    a. Face Design: Flanges formed in stepped design with a center protrusion projecting 19/64 inch (7.54 mm) below flange surfaces supporting panel faces and forming

3/16-inch- (4.76-mm-) wide reveals between edges of protrusion and those of panels.

b. Structural Classification: Intermediate-duty system.
c. Exposed Metal Finish: Steel sheet painted to match color of acoustical panel.
d. Manufacturer and Product: Armstrong; Interlude XL 9/16” Dimensional Tee System.

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, anchorage, with requirements for installation tolerances, and other conditions affecting performance of acoustical panel ceilings.

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

3.2 PREPARATION

A. Layout the work to center board pattern both directions around work points shown in each major space or room as shown on the drawings or directed and, where possible, adjust pattern so that edge pieces will be not less than 1/2 unit in width.

3.3 INSTALLATION, GENERAL

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions, the CISCA "Ceiling Systems Handbook," and as required to match the accepted sample installation.

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.
2. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."

B. Suspend ceiling hangers as follows:

1. Fasten hangers to anchors that extend into decks. Space hangers not more than 48" o.c. along each member (carrying channel) supported directly from hangers; and provide hangers not more than 6" from ends of each member (carrying channel). Provide additional hangers for support of fixtures and other items including but not limited to light fixtures and diffusers, as required to prevent overloading of deck attachment, eccentric deflection or rotation of supporting runners.
2. Hangers:

a. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers directly to drilled in anchors (eye screws), or other devices that are secure, and are appropriate for substrate.

b. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to drilled in anchors, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved.

3. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
4. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
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. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Align moldings accurately and fasten securely to construction by screw attaching to substrate at intervals not over 16" o.c. and not more than 3" from ends, leveling with ceiling suspension system.

a. Miter corners accurately and connect securely.

2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

D. Install suspension system runners so they are square and securely interlocked with one another. Clip runners to angle moldings do not use exposed fasteners. Finish to lines and levels shown, with maximum deflection not to exceed 1/360 of the span between supports. Laser level accurately in all directions, leveling to a tolerance of 1/8" noncumulative. Remove and replace dented, bent, or kinked members.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Run grain of units in one direction as accepted on shop drawings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

1. 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.

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 09 51 23

SECTION 09 64 66 – WOOD ATHLETIC FLOORING

PART 1-GENERAL

1.01 DESCRIPTION (WF-01)

A. Related work specified under other sections.
   1. Concrete and Concrete Finishing: Section 03 30 00

1.02 QUALITY ASSURANCE

A. Floor System Manufacturer Qualifications
   1. Manufacturer shall be an established firm experienced in field and have been in business or a minimum of ten (10) years; Robbins, Inc. or an approved equal.
   2. Manufacturer will be a member in good standing of the Maple Flooring Manufacturers Association (MFMA).

B. Floor Contractor/Installer Qualifications and Certifications
   1. Flooring contractor shall be a firm experienced in flooring field and approved by manufacturer.
   2. Submit a list of at least three completed projects of similar magnitude and complexity.

1.03 SUBMITTALS

A. Manufacturer's Product Data
   1. Submit specification sheet.
   2. Suppliers shall submit certificates attesting that materials furnished will meet specifications for grade, quality, dryness and treatment, if required.

B. Concrete Guidelines
   1. Submit three (1) copy of MFMA Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive wood flooring.

C. Samples
   1. Submit one (1) sample of tread and riser. Sample to be made by the manufacturer and so indicated.

D. Maintenance Literature
   1. Submit copy of Maintenance Instructions.

E. LEED Submittals:

   1. Certificates for Credit MR 7: Chain-of-custody certificates certifying that wood flooring complies with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body.

      a. Include statement indicating costs for each certified wood product.

   2. Product Data for Credit EQ 4.1: For adhesives, documentation including printed statement of VOC content.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials
   1. Materials shall not be delivered, stored or installed until all masonry, painting, plastering tilework, is complete, and all overhead mechanical work, lighting, is complete. Room temperature of 55-80 degrees Fahrenheit (13 to 27 degrees Celsius) and relative humidity of 35-50 % are to be maintained. Ideal installation/storage conditions are the same as those that will prevail when building is occupied.
   2. Materials shall not be stored at the installation location if the moisture content of the concrete slab exceeds 4% or vapor transmission exceeds 4 pounds per 1,000 square feet (2.20 kg per 100 square meters).

1.05 JOB CONDITIONS-SEQUENCING

A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.04 A are obtained.

B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.

C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Maintain a temperature range of 55 to 80 degrees Fahrenheit (13 to 27 degrees Celsius) and a relative humidity range of 35 to 50%. Consult MFMA guidelines for further information.

D. After floors are finished, area to be kept locked by general contractor to allow curing time for the finish. If after required curing time general contractor or owner requires use of stair, he shall protect the floor by covering with non-fibered kraft paper or red rosin paper with taped joints, until acceptance by owner (or owner's agent) of complete assembly.

PART 2-PRODUCTS

2.01 MATERIALS

A. Maple Flooring (Basis-of-Design Product)
   1. ½" (11mm) thick x 2-¼" (57mm) width, 2nd&Btr grade, Prefinished TGEM, KD Northern Hard Maple, Continuous Strip® XL_{450} Flooring as manufactured by Robbins and graded in accordance with MFMA-FJ rules. Flooring will have XL_{plus}™ technology to reduce or eliminate routine spacing for expansion.

      a. Options:
         1) Face Width: 2 ½" face width.
         2) Grade: 1st Grade.
         3) Finish treatment: Factory-Sanded and Factory Sealed.
         4) Certified Wood: FSC certified lumber.

B. Fasteners
   1. Robbins Elastomeric Sportwood Adhesive (one-part urethane). No two-part adhesives are acceptable. Poly-vinyl acetate (PVA) or chlorinated solvent adhesives shall not be substituted.

PART 3-EXECUTION

3.01 INSPECTION

A. Inspect concrete slab for proper tolerance and dryness, and report any discrepancies to the general contractor and architect in writing. Slab will be level to within 1/8" (3mm) in a 10' (3m). Moisture content of the concrete slab shall not exceed 4% or vapor transmission exceeds 4pounds per 1,000 square feet.
B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the general contractor.
C. Subfloor shall be broom cleaned by general contractor.
D. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

3.02 INSTALLATION

A. Maple Flooring
    a. Trowel on adhesive to approximately 50 square feet (4.6 square meters) per gallon.
    b. Install maple flooring in adhesive, laying in specified pattern end to end.
    c. Roll installed wood with flooring roller at least 30 minutes after installation to insure proper adhesive transfer.

3.03 FINISHING

A. Clean any adhesive from face with mineral spirits prior to curing

3.04 VERTICAL INSTALLATION

1. Install base anchored to walls with base cement. Use neatly mitered inside and outside corners.

3.05 CLEANING

1. Clean up all unused materials and debris and remove it from the premises.

END OF SECTION 09 64 66

SECTION 09 65 00 - RESILIENT FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes resilient floor tile.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Samples: Submit full -size units of each color and pattern of resilient floor tile required.

C. Maintenance Data: Submit maintenance data for resilient floor tile and floor finish products.

D. LEED Submittals:
1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.
    a. Include a statement indicating costs for each product having recycled content.
3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.
    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.
4. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

1.3 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 (10 deg C) or more than 90 deg F (32 deg C). Store tiles on flat surfaces.

1.4 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

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

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE

A. Static Dissipative Vinyl Composition Tile (VCT) (RT-01): Provide vinyl composition tile having a nominal total thickness of 1/8 in. (3.2 mm), 12 in. x 12 in. (305 mm x 305 mm) face dimensions, and composed of polyvinyl chloride resin binder, plasticizers, fillers, and pigments with colors and texture dispersed uniformly throughout its thickness. Vinyl composition tile shall conform to the requirements of ASTM F 1066, Class 2 – through pattern.

B. Products and Manufacturer: Refer to the Finish Materials Schedule drawing

2.2 RUBBER FLOOR TILE

A. Rubber Floor Tile (RT-02): Provide rubber floor tile having a nominal thickness of 1/8", 24" x 24" face dimensions and composed of recycled rubber.

1. Rubber floor tile shall conform to the following properties:

a. Tensile Strength, lb/in^2 (ASTM D412): 200 min.
b. Flexibility, 1/4 inch mandrel (ASTM F137): pass.
c. Static Load, 400 lb/in^2 (ASTM F970): less than 0.005 in.
d. Coefficient of Friction (ASTM D2047): greater than 0.9.
e. Chemical Resistance (ASTM F925):

1) 5% Acetic Acid: No Change.
2) 70% Isopropyl Alcohol: No Change.
3) 5% Sodium Hydroxide: No Change.
4) 5% Hydrochloric Acid: No Change.
5) 5% Ammonia: No Change.
6) Bleach: No Change.
7) 5% Phenol: No Change.
8) Sulfuric Acid: No Change.

f. Ambient Noise Reduction, $Sabin/ft^2$ (ASTM C423): 0.05.
g. Thermal Conductivity, BTU-in/hr-ft^2-°F (ASTM C518): approximately 0.445.

h. Impact Insulation Class (ASTM E492): 48.
i. Sound Transmission Coefficient (ASTM E413): 51.
j. Sustainability (ASTM E2129): data collected.

2. Product and Manufacturer: Refer to the Finish Materials Schedule drawing

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based formulation provided or approved by resilient product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

C. Vinyl Composition Tile Protective Floor Polish: Product recommended by manufacturer to suit resilient products indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare concrete substrates as follows:

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

2. Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

C. Remove paint, sealers, substrate coatings, and other substances that are incompatible with adhesives using mechanical methods recommended by manufacturer. Do not use solvents.

D. Use trowelable leveling and patching compound to fill cracks, holes, and depressions in substrates.

E. Apply primer to concrete slabs, if recommended by the flooring manufacturer, prior to application of adhesive.

F. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are same temperature as space where they are to be installed.

G. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 TILE INSTALLATION

A. Lay out tiles 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, unless otherwise indicated.

B. Match 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.

C. Scribe, cut, and fit tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, edgings, door frames, thresholds, and nosings. Extend unexposed edges of flooring under set on bases and similar trim work.

D. Extend tiles into toe spaces, door reveals, closets, and similar openings.

E. 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.

F. Install tiles on covers for telephone and electrical ducts and similar items in finished floor areas. Maintain overall continuity of color and pattern with pieces of tile installed on covers. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.

G. Adhere tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation which is smooth, clean and free from imperfections such as open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. 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.
4. Do not wash or apply floor polishes until flooring adhesives have cured unless otherwise recommended by the flooring manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

1. Apply protective floor polish to horizontal surfaces that are free from soil, visible adhesive, and surface blemishes using methods as recommended in writing by the floor polish manufacturer. Apply no fewer than 2 coats of floor polish unless additional coats are recommended by the floor polish manufacturer for the application indicated.

   a. Use commercially available product acceptable to manufacturer.

2. Cover products installed on horizontal surfaces with undyed, untreated building paper until Substantial Completion.
3. Do not move heavy and sharp objects directly over surfaces. Place hardboard or plywood panels over flooring and under objects while they are being moved. Slide or roll objects over panels without moving panels.

END OF SECTION 09 65 00

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes resilient wall base and accessories.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

B. Samples: Submit samples 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. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.

1.3 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 (10 deg C) or more than 90 deg F (32 deg C).

1.4 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), 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. After postinstallation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

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

1.5 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. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT WALL BASE

A. Wall Base (WB-02, WB-04 and WB-04): Complying with ASTM F 1861, Type TS (vulcanized thermoset rubber), Group 1, Styles A and B.

B. Styles: Provide the following unless otherwise indicated on the Finish Schedule:

1. Hard Surfaced Floors: Cove (with top-set toe).
2. Carpeted Floors: Straight (toeless).

C. Minimum Thickness: 0.125 inch (3.2 mm).

D. Height: 2-1/2 inches (64 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed.

G. Inside Corners: Job formed.

H. Surface: Smooth.

I. Manufacturers, Colors and Patterns: Refer to Finish Materials Schedule drawing.

2.2 INSTALLATION MATERIALS

A. Adhesives: Water-resistant water based type recommended by resilient base manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

3.3 RESILIENT WALL BASE INSTALLATION

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.

2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

3.4 CLEANING

A. Remove adhesive and other blemishes from exposed surfaces.

END OF SECTION 09 65 13

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes carpet tile and installation.

1.2 STANDARDS

A. Except as modified by governing codes and by the Contract Documents, comply with the applicable provisions and recommendations of the following:

1. The Carpet and Rug Institute "The Carpet Specifiers' Handbook."

2. The Carpet and Rug Institute "CRI 104 Commercial Carpet Installation Standard."

1.3 SUBMITTALS

A. Product Data: Submit product data, specifications, installation instructions for materials specified herein and other data as may be required to show compliance with the Contract Documents including written data on physical characteristics, durability, resistance to fading, compatibility and adhesion test results, and flame resistance characteristics. Include installation recommendations for each type of substrate required.

B. Shop Drawings: Submit shop drawings showing the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation, carpet locations, direction, and starting points per floor.
6. Pile direction.
7. Type, color, and location of insets and borders.
8. Type, color, and location of edge, transition, and other accessory strips.
9. Transition details to other flooring materials.

C. Samples: Submit samples showing full range of color, texture, and pattern variations expected. Prepare samples from same material to be used for the Work. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules. Submit the following:

1. Carpet Tile: Full-size Samples.
2. Exposed Edge Stripping and Accessory: 12-inch- (300-mm-) long Samples.

D. Maintenance Data: Submit copies of instructions for care, cleaning, maintenance and repair of carpeting.

1. Each carpet manufacturer shall meet with the authorized Building Services personnel in the presence of the Owner and Architect, to review the characteristics of his product and to recommend appropriate maintenance procedures, prior to occupancy of the finished spaces.

E. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1 : For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1 : For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Product Data for Credit EQ 4.3:

a. For carpet tile, documentation indicating compliance with testing and product requirements of Carpet and Rug Institute's "Green Label Plus" program.
b. For installation adhesive, including printed statement of VOC content.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Engage a carpet installer, who has completed a minimum of three (3) projects over the last 10 years which were similar in material, design and extent to that indicated for the project - as determined by the Architect – and which have resulted in construction with a record of successful in service performance.

1. In the case where the Installer is actually a Dealer, it is understood that the terms Installer, Dealer, Carpeting Contractor and Contractor shall be one and the same for purposes of this Contract. He shall assume responsibility for all of the work, including acquisition of the materials from the manufacturers herein specified.

B. Mill Inspection: The carpeting may be inspected to determine compliance with the Contract Documents with respect to manufacture, materials, pattern and colors. Inspection may be made at the mill by a representative of the Architect and/or Owner at any time during the process of manufacture.

C. Sample Installations: Before installing carpet, install sample installation, for each type of carpet installation required to demonstrate aesthetic effects and qualities of materials and execution. Install sample installations to comply with the following requirements, using materials indicated for the completed Work:

1. Size and Location: Provide 250 square foot sample installation in location as directed by Architect.
2. Demonstrate the proposed range of aesthetic effects and workmanship.
3. Obtain Architect's approval of sample installations before starting work.
4. Maintain sample installations during construction in an undisturbed condition as a standard for judging the completed Work.
5. Approved sample installations may become part of the completed Work if undamaged at time of Substantial Completion.

D. Testing: The contractor shall submit test results and/or certifications for the tests listed below, in addition to tests listed under carpet type performance requirements in section 2 of this specification.

1. Vetterman Drum ASTM D 5417
2. AATCC 175 GSA Stain Test
3. Lightfastness AATCC 16 part 3
4. Atmospheric Fading: AATCC 129- Ozone
5. Atmospheric Fading: AATCC 164- Oxides of Nitrogen
6. Tuft bind ASTM D 1335: dry testing only andd wet and dry testing
7. Delamination ASTM D 3936

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver carpeting in original mill protective wrapping with mill register numbers and tags attached.

B. Deliver other materials in manufacturers unopened containers identified with name, brand, type, grade, class, and other qualifying information.

C. Store materials in a dry location, in such a manner as to prevent damage.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained within the levels indicated for Project when occupied for its intended use.

B. Do not install carpet tile 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.

1.7 WARRANTY

A. Special Carpet Tile Manufacturer's Warranty: Written warranty, signed by carpet tile manufacturer agreeing to replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, more than 10 percent loss of face fiber, wear, static buildup in excess of 3.0 kV when tested under the Standard Shuffle Test at 70 degrees F. and 20% RH, edge raveling without seam sealers, tuft bind loss, zippering (wet or dry), shrinkage, curling, doming, snags, runs, and delamination. Warrantees shall be full term, not pro-rated for the specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Special Carpet Tile Installer's Warranty: Written warranty, signed by carpet tile installer agreeing to fix, repair or replace carpet tile that does not comply with requirements or that fails within specified warranty period. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse. Failures include, but are not limited to, edge raveling, shrinkage, curling, doming, and delamination.

1. Warranty Period: 2 years from date of Substantial Completion.

1.8 EXTRA MATERIALS

A. Surplus Stock: Package and deliver usable remnants of carpet to the Owner's storage room as directed by the Owner at the conclusion of the job. Include any uncut carpet tiles.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Carpet Tile Types: Provide manufacturers commercial grade carpet tile for 100% glue down installation as scheduled on the drawings. Each carpet tile selected shall comply with the following minimum performance requirements:

B. CP-1: Preferred Basis of Design Manufacturer and Product: Shaw N655S-0, matching Architect's sample and the construction described below.

1. Carpet Construction: Multi-Scroll

2. Fiber Content: NSP Eco Sol Q Nylon

3. Surface Texture: Cut pile.

4. Dye Method: Solution dyed.

5. Gauge: 1/12 inch

6. Stitches: 10 per inch

7. Tufted Pile Height: 0.166 inch.

8. Average Pile Density: 7,000 - 8,000.

9. Tufted Face Yarn Weight: Not less than 24 oz./s.y. when tested in accordance with ASTM D5848.

10. Primary Backing: Woven polypropylene. Shall be dimensionally stable and warranted not to cup, dome or dish when a releasable adhesive is used.

11. Secondary Backing: Ecoworx by Shaw. Shall be dimensionally stable and warranted not to cup, dome or dish when a releasable adhesive is used.

12. Size: 24" x 24"

13. Performance:

    a. Radiant Panel: Carpet shall pass ASTM E648; Class 1 when tested in glue down configuration.

    b. Smoke Density: Carpet shall pass NFPA 258; less than 450.

    c. Static: Carpet shall be treated to prevent static build-up in excess of 3.0 kV when tested under the standard shuffle test at 70 degrees F. and 20% relative humidity (per AATCC 134).

    d. Flammability: Carpet shall pass DOC FF-I-70 pill test.

    e. Tuft Bind: Carpet shall exhibit a guaranteed 20 lb. average tuft bind, wet or dry, as tested in accordance with ASTM D1335.

    f. Color Fastness to Light: 4 on the Gray Scale for color change when exposed to a minimum of 80 fading units per AATCC 16.

    g. Soil Treatment: Provide manufacturers standard fluorocarbon treatment to carpet fibers to resist soiling.

C. CP-1: Alternate Manufacturer and Product: Interface 250250-032 GlasBac® tile, matching Architect's sample and the construction described below.

1. Carpet Construction: Tufted Cut and Loop

2. Yarn System: Blue Chip™ Type 6,6 Nylon

3. Surface Texture: Cut pile.

4. Dye Method: 100% Solution dyed.

5. Gauge: 5/64 in.

6. Stitches: 13 per inch

7. Tufted Pile Height: 0.166 inch.

8. Average Pile Density: 7,000 - 8,000.

9. Tufted Face Yarn Weight: Not less than 28 oz./s.y. when tested in accordance with ASTM D5848.

10. Primary Backing: Woven polypropylene. Shall be dimensionally stable and warranted not to cup, dome or dish when a releasable adhesive is used.

11. Secondary Backing: Reinforced thermoplastic composite. Shall be dimensionally stable and warranted not to cup, dome or dish when a releasable adhesive is used.

12. Size: 19.69" x 19.69"

13. Performance:

    a. Radiant Panel: Carpet shall pass ASTM E648; Class 1 when tested in glue down configuration.

    b. Smoke Density: Carpet shall pass NFPA 258; less than 450.

    c. Static: Carpet shall be treated to prevent static build-up in excess of 3.0 kV when tested under the standard shuffle test at 70 degrees F. and 20% relative humidity (per AATCC 134).

    d. Flammability: Carpet shall pass DOC FF-I-70 pill test.

    e. Tuft Bind: Carpet shall exhibit a guaranteed 20 lb. average tuft bind, wet or dry, as tested in accordance with ASTM D1335.

    f. Color Fastness to Light: less than 4 on the Gray Scale for color change when exposed to a minimum of 60 fading units per AATCC 16.

    g. Soil Treatment: Protekt^2 ®

    h. Antimicrobial: (AATCC 138 Washed) (AATCC 174 Parts 2&3) Intersept®

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Portland -cement-based formulation provided by or recommended by the carpet manufacturer. Do not use gypsum based compounds.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, high solids, low VOC emitting specifically recommended, as verified through compatibility and adhesion testing, by the carpet manufacturer for the application shown, type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet and as follows:

    1. Carpet Tile Installation, Typical: Release type adhesive.

C. Carpet Edging: Provide homogenous vinyl or rubber composition carpet edging in single lengths wherever possible, keeping the number of joints or splices to a minimum. Provide in quantities and locations as job required based upon the recommended good practice of the industry; include in every location where carpet terminates and other flooring continues. Color to match adjacent carpet types.

D. Floor Sealer: Type as recommended and manufactured by the carpet tile manufacturer for the applications indicated.

PART 3 - EXECUTION

3.1 PRE-INSTALLATION MEETING

A. Prior to the installation, and at the Contractor's direction, meet at the project site to review the material selections, substrate preparations, installation procedures, coordination with other trades, special details and conditions, standard of workmanship, and other pertinent topics related to the Work. The meeting shall include the Owner, Architect, the Contractor, the installer, material manufacturer's representatives, and representatives of other trades or subcontractors affected by the installation.

3.2 PREPARATION

A. Coordinate the installation of carpet so as not to delay the occupancy of the site or interfere with the completion of construction.

B. Examine the substrates, adjoining construction and the conditions under which the Work is to be installed. Verify recommended limits for moisture content and alkalinity of concrete substrates with carpet manufacturer.

1. Moisture Content: Verify moisture content using a standard calcium chloride crystal test or a 1 yd. x 1 yd. clear plastic test. Perform testing at a frequency as recommended by the carpet manufacturer. Perform testing at a frequency of not less than once every 1,000 square feet.

2. Alkalinity Test: Verify alkalinity of concrete substrates by drilling a 3/8" diameter hole approximately 1/4" deep, remove all residue; fill with distilled water, allow water to stand 3 minutes and test with a calibrated electronic meter or Ph paper. Perform testing at a frequency of not less than once every 1,000 square feet.

3. Alternative test procedures for moisture content and alkalinity may be acceptable subject to the carpet manufacturer’s review and written acceptance.

C. Concrete Subfloors: Verify that concrete slabs comply with the following:

1. Provide one of the following:

a. 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 the carpet manufacturer.

b. In lieu of mechanical substrate preparation methods the Contractor may utilize floor sealer materials and methods of the types and methods as recommended, in writing, by the carpet tile manufacturer. Apply sealer in number of coats, and at the spread rate, as required by the carpet tile manufacturer.

2. 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 the carpet manufacturer.

3. Use leveling and patching compounds recommended by flooring manufacturer for filling cracks, holes and depressions in the substrate. Surface shall be smooth, level and at proper elevation. Remove ridges, roughness and protrusions from concrete surfaces by grinding.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet.

E. Carpet installation shall not commence until painting and finishing work are complete and ceiling and overhead work is tested, approved, and completed.

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

3.3 INSTALLATION

A. General: Comply with the manufacturer's instructions, specified industry standards and recommendations, and as required to match the accepted sample installations. Apply adhesive in accordance with adhesive manufacturer's directions.

B. Adhere perimeter tiles, and cut tiles, with a full spread of adhesive. Dry fit cut tiles and apply adhesive to tile back after tile has been cut. Use full uncut tiles down the center of corridors and, where necessary, cut perimeter tiles to butt walls.

1. 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.

2. Cut openings in carpet for electrical outlets, piping and other penetrations. Maintain close tolerances so that edges of carpet will be covered by plates and escutcheons.

3. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

C. In traffic areas adhere all tiles with a full spread of adhesive. Ensure uniform bond over the entire area. In non-traffic areas only adhere perimeter tiles with full spread of adhesive.

D. Butt carpet tile tightly together to form seams without gaps or entrapped pile yarns and aligned with adjoining tiles.

E. Edge Strip Installation: Install edge strip at every location where edge of carpet is exposed to traffic, unless otherwise indicated. Unless otherwise directed by Architect install in single lengths and secure in accordance with manufacturer's directions.

F. Traffic over adhesive installations shall be restricted until adhesive has properly cured in accordance with the adhesive manufacturers recommendations.

3.4 CLEANING AND PROTECTION

A. Cleaning: As the carpeting is installed, remove and dispose of all trimmings, excess pieces of carpeting and laying materials from each area as it is completed. Vacuum carpeting with a commercial vacuum, having a cylindrical brush or beater bar and high suction. Remove adhesives, stains, and soil spots in accordance with the carpet manufacturers recommendations.

B. Protection: Protect carpeting against damage of every kind as damaged carpeting shall be rejected. Use non-staining cover material for protection. Tape joints of protective covering.

1. Plastic and polyethylene sheet protective coverings shall not be permitted over glue down installations.

2. Remove and replace rejected carpeting with new carpeting. At the completion of the work and when directed by the Architect, remove covering, vacuum clean carpeting and remove soiling and stains (if any) to the satisfaction of the Architect.

END OF SECTION 09 68 13

SECTION 097700- SPECIAL WALL SURFACING (SOLID PHENOLIC WALL PANELING)

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes: Solid phenolic wall cladding

B. Related Sections: Section(s) related to this section include:
1. Rough Carpentry: Division 6 Rough Carpentry Section.
2. Finish Carpentry: Division 6 Finish Carpentry Section.
3. Architectural Woodwork and Casework: Division 6
4. Metal Framing and Furring: Division 9 Metal Framing Section.
5. Gypsum Board Substrate: Division 9 Gypsum Board Assemblies Section.

1.02 REFERENCES

A. ASTM International:
1. ASTM D792 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.03 SYSTEM DESCRIPTION

A. Performance Requirements: Provide panels that have been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.04 SUBMITTALS

A. General: Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures Section.

B. Product Data: Submit manufacturers product data

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including edge conditions, panel
joints, anchorage, accessories, finish colors, patterns and textures.

D. Samples: Submit selection and verification samples for finishes, colors and textures.

E. Quality Assurance Submittals: Submit the following:
1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
2. Certificates:

a. Qualification Certificates: Submit certificate indicating compliance with qualification requirements in Quality Assurance article.
b. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
3. Manufacturer's Instructions: Manufacturer's installation instructions.
4. Manufacturer's Field Reports: Manufacturer's field reports specified herein.
F. Closeout Submittals: Submit the following:
1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.05 QUALITY ASSURANCE

A. Qualifications:
1. Manufacturer Qualifications: Manufacturer producing product in ISO 9001 certified facility, capable of providing field service representation during fabrication and approving application method.
a. Obtain from a single manufacturer.
2. Fabricator/Installer Qualifications: Installer shall be approved by the manufacturer and be experienced in performing work of similar type and scope.

B. Mock-Ups: Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owners and Architects acceptance of finish color, texture, pattern and workmanship standards. Comply with Division 1 Quality Control (Mock-Up Requirements) Section.
1. Mock-Up Size: 2 full panel widths with outside corner trim
2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
3. Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

C. Preinstallation Meetings: Conduct preinstallation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination Section.

1.06 DELIVERY, STORAGE & HANDLING

A. General: Comply with Division 1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.

C. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

D. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer.

1.07 PROJECT CONDITIONS
A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.08 WARRANTY

A. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty is in addition to, and not a limitation of, other rights Owner may have under Contract Documents.

PART 2 PRODUCTS

2.01 SOLID PHENOLIC WALL PANELS

A. Manufacturer: Trespa North America, or approved equal.

1. Contact: Trespa North America, 12267 Crosthwaite Circle, Poway, CA 92064; Telephone: (800) 487-3772

B. Wall Panel:
1. Trespa Virtuon.
a. Material: Solid phenolic wall panel.
b. Color and Pattern: White
c. Panel Core: Standard black core
e. Panel Thickness: 3/8 inch (10 mm)
f. Modulus of Elasticity: 1,500,000 psi (10,335 MPa) minimum per DIN 53457.
g. Tensile Strength: 13,000 psi (90 MPa) per DIN 53455.
h. Flexural Strength: 14,500 psi (100 MPa) minimum per DIN 53452.
i. Surface Impact Resistance: 4 index minimum per EN 438-2 (11).
j. Scratch Resistance: 4 index minimum per EN 438-2 (14).
k. Anti-Static Properties: Anti-static per DIN 51 953 and DIN 53 482.
l. Flamespread index of 10 perASTM E84
m. Smoke developed index of 45 - 75 per ASTM E84.
n. Water Absorption: Less than 1.0% per EN 438-2 (7).
o. Porosity: Nonporous surface and edges.
p. Microbial Characteristics: Will not support microorganic growth.
q. Sanitation Characteristics: Suitable for FDA food preparation environments.
r. Cleanability: Resists dirt pickup. Easily cleaned.

2.02 PRODUCT SUBSTITUTIONS
A. Substitutions: Substitutions permitted per 01 25 13

2.03 ACCESSORIES
A. Metal Trim: Provide specialized mounting clips and trim manufactured by Wall Panel Systems, Colton, CA (877)333-4WPS or approved equal in profiles shown on drawings.

2.04 FABRICATION

A. Fabricate solid phenolic wall panels and accessory items in accordance with manufacturer's recommendations and approved submittals.

B. Fabricate panels to profile indicated.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS
A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions and product carton instructions for installation.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

A. Surface Preparation: Surface shall be clean, plumb and level.

3.04 INSTALLATION

A. Install solid phenolic wall panels plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals.

B. Fasten solid phenolic wall panels to supporting substrate with specialized mounting clips fasteners noted in section 2.03.

C. Accessory Items: Install corner profiles, gaskets and trim with fasteners and adhesive appropriate for use with adjoining construction as indicated on drawings and as recommended by manufacturer.

3.05 FIELD QUALITY REQUIREMENTS

A. Manufacturer's Field Services: Upon Owner's request, provide manufacturer's field service consisting of product use recommendations and two site visits for inspection of product installation in accordance with manufacturer's instructions.
1. Site Visits: One site visit to view mock-up and one site visit at midpoint of installation.

3.06 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace damaged installed products. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Remove construction debris from project site and legally dispose of debris.

3.07 PROTECTION

A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION 09 77 00

SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and field painting of exposed exterior and interior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

a. Architectural woodwork.
b. Metal toilet enclosures.
c. Metal lockers.
d. Elevator entrance doors and frames.
e. Elevator equipment.
f. Finished mechanical and electrical equipment.
g. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Furred areas.
b. Ceiling plenums.
c. Pipe spaces.
d. Duct shafts.
e. Elevator shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.
b. Stainless steel.

c. Chromium plate.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.2 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

B. Gloss ranges used in this Section include the following:

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
3. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
4. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

C. Exterior Surfaces: Exterior surfaces to be painted are defined as those surfaces which are indicated in areas exposed to conditions which are not controlled by building heating and cooling systems.

D. Interior Surfaces: Interior surfaces to be painted are defined as those surfaces which are indicated in areas exposed to conditions which are controlled by building heating and cooling systems.

1.3 SUBMITTALS

A. Product Data: Submit product data for each paint system indicated. Include block fillers and primers.

1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC’s). Include VOC content expressed in grams per liter

B. Samples: Submit samples for each color and material to be applied, with texture to simulate actual conditions.

1. Provide stepped Samples, defining each separate coat, including primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
2. Provide a list of materials and applications for each coat of each Sample. Label each Sample for location and application.
3. Submit paint samples on 12” square of hardboard for the Architect's review of each color and texture required.

C. LEED Submittals:

1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and other identifying information.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.6 PROJECT CONDITIONS

A. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95 deg F (7 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

Conventional Coatings

1. Benjamin Moore & Co. (Benjamin Moore).
2. M. A. Bruder & Sons, Inc. (M. A. B. Paint).
3. PPG Industries, Inc. (Pittsburgh Paints).
4. Sherwin-Williams Co. (Sherwin-Williams).
5. Duron Paints and Wallcoverings (Duron).

High Performance Coatings

1.Tnemec Kanas City MS
2. Dupont Wilmington DE
3. International Paints Houston TX

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. VOC Classification: Provide materials, including primers, undercoats, and finish-coat materials, that meet the Ozone Transport Commission (OTC) Regulations on VOC limits for Architectural Coatings which are as follows:

1. 100 grams/liter or less for flat coatings.
2. 150 grams/liter or less for non-flat coatings.
3. 250 grams/liter or less for non-flat, high gloss coatings.
4. 200 grams/liter or less for primers, sealers, and undercoaters.
5. 340 grams/liter or less for industrial maintenance coatings.
6. 250 grams/liter or less for floor coatings.

D. Colors: Provide custom colors of the finished paint systems to match the Architect's samples.

2.3 PREPARATORY COATS

A. Concrete Unit Masonry Block Filler: High-performance latex block filler of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

B. Exterior Primer: Exterior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal and Aluminum Substrates: Rust-inhibitive metal primer.
2. Aluminum Substrates: Acrylic metal primer.
3. Zinc-Coated Metal Substrates: Galvanized metal primer.
4. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

C. Interior Primer: Interior latex-based primer of finish coat manufacturer and recommended in writing by manufacturer for use with finish coat and on substrate indicated.

1. Ferrous-Metal Substrates: Quick drying, rust-inhibitive metal primer.
2. Zinc-Coated Metal Substrates: Galvanized metal primer.
3. Interior Concrete Primer: Factory-formulated alkali-resistant acrylic-latex interior primer for interior application.
4. Interior Gypsum Board Primer: Factory-formulated latex-based primer for interior application.
5. Where manufacturer does not recommend a separate primer formulation on substrate indicated, use paint specified for finish coat.

2.4 EXTERIOR FINISH COATS

A. Exterior Ferrous Metals and Structural Steel and Other Metals:

1. Tnemec N69 Epoxoline at 3.0-3.5 mils DFT.
2. Dupont 25 P at 3.0-4.0 mils DFT
3. International 475 HS

Topcoats-
1.Tnemec 1071/1072 Flournar Floropolymer at 2.5 –3.0 mils DFT
2.Dupont Floropolymer at 2.0-3.5 mils DFT
3. International Floropolymer at 2.5 –3.5 mils DFT

2.5 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.

1. Benjamin Moore; Pristine Eco Spec Interior Latex Flat Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
2. Duron; Genesis Interior Latex Flat 60-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
3. M. A. B. Paint; Enviro-Pure Latex Flat 040 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Wall Flat Latex: Applied at a dry film thickness of not less than 1.2 mil.
5. Sherwin-Williams; Harmony Latex Flat B5 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

B. Interior Flat Latex-Emulsion Size: Factory-formulated flat latex-based interior paint.

1. Benjamin Moore; Pristine Eco Spec Interior Latex Flat Finish: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
2. Duron; Genesis Interior Latex Flat 60-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
3. M. A. B. Paint; Enviro-Pure Latex Flat 040 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Wall Flat Latex: Applied at a dry film thickness of not less than 1.2 mil.
5. Sherwin-Williams; Harmony Latex Flat B5 Series: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).

C. Interior Low-Luster Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Eco Spec Interior Latex Eggshell Enamel No. 223: Applied at a dry film thickness of not less than 1.4 mils ((0.036 mm).
2. Duron; Genesis Interior Latex Low Sheen Enamel 79-101: Applied at a dry film thickness of not less than 1.3 mils (0.033 mm).
3. M. A. B. Paint; Enviro-Pure Eggshell 045 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Eggshell Wall and Trim: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).
5. Sherwin-Williams; Harmony Latex Eggshell B9 Series: Applied at a dry film thickness of not less than 1.4 mils (0.036 mm).

D. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Eco Spec Interior Latex Semi-Gloss Enamel No. 224: Applied at a dry film thickness of not less than 1.4 mils ((0.036 mm).
2. Duron; Genesis Interior Latex Semi-Gloss Enamel 83-101: Applied at a dry film thickness of not less than 1.5 mils (0.038 mm).
3. M. A. B. Paint; Enviro-Pure Semi-Gloss 047 Line: Applied at a dry film thickness of not less than 1.2 mils (0.030 mm).
4. Pittsburgh Paints; Pure Performance Interior Enamel Wall & Trim Semi-Gloss Latex: Applied at a dry film thickness of not less than 1.1 mils (0.028 mm).
5. Sherwin-Williams; Harmony Interior Latex Semi-Gloss Enamel: Applied at a dry film thickness of not less than 1.6 mils (0.041 mm).

E. Epoxy Enamel Floor Paint:

1. Tnemec 287 Tneme-Tred at 3.0 mils DFT
2. Dupont 25P at 3.0-4.0 mils DFT
3. International Inter H20 735 at 4.0-5.0 mils DFT

F. Epoxy Wall and Ceiling Paint: Factory-formulated semigloss acrylic-epoxy coatings for interior application to wallboard substrates in wet areas.

1. Tnemec 113 Tufcoat at 3.0 mils DFT
2. International H20 735 Acrylic Epoxy Coating semi-gloss.

Topcoats

3. Tnemec 1081 Enduarshield WB at 2.0-3.0 mils DFT
4. International Water Based Urethane at 2.0-3.0 mils DFT

2.6 TRAFFIC PAINT

A. Traffic paint:

1. M. A. B. Paint; Zone Marking Traffic Paint (183001 white, 183002 white).
2. Sherwin Williams; Set Fast Premium Traffic Marking Paint (white A300, yellow A303).
3. Duron: Dura Clad Alkyd Zone Marking Paint 993-8000 white, or 993-8001 yellow.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for paint application. Comply with procedures specified in PDCA P4.

1. Proceed with paint application only after unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection before surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Cementitious Materials: Prepare concrete and concrete masonry block surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.
    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces if moisture content exceeds that permitted in manufacturer's written instructions.
    c. Clean concrete floors to be painted with a 5 percent solution of muriatic acid or other etching cleaner. Flush the floor with clean water to remove acid, neutralize with ammonia, rinse, allow to dry, and vacuum before painting.

3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, and other foreign substances in accordance with SSPC SP 1 “Solvent Cleaning”. After solvent cleaning prepare any bare metal surfaces by removing all stratified rust (rust scale), all loose mill scale, all loose or non-adherent rust and detrimental welding deposits by methods specified in SSPC SP-3 "Power Tool Cleaning".

    a. Touch up bare areas, heads of bolts, welded surfaces which are unpainted, and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with same primer as the shop coat.
    b. Surfaces requiring touch up painting shall be cleaned and primed as soon as practicable after erection and before excessive rusting or other damage occurs to such surfaces from weather or other exposure.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents in accordance with SSPC SP-1 “Solvent Cleaning”, and pretreat in accordance with the recommendations of SSPC “Good Painting Practice”, Vol. 1, Chapter 22.

5. Gypsum Wallboard: Repair all surfaces in gypsum wallboard with wallboard joint finishing compound or spackling compound, filled out flush and sanded smooth. Clean all surfaces and taped joints of dust, dirt and other contaminants and be sure they are thoroughly dry before applying paint.

D. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the paint schedules.
2. Provide finish coats that are compatible with primers used.
3. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, grilles, convector covers, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.
4. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
5. Paint interior surfaces of ducts with a flat, nonspecular black paint where visible through registers or grilles.
6. Paint back sides of access panels and removable or hinged covers to match exposed surfaces. Access panels, electrical panels, air diffusing outlets, supply and exhaust grilles, louvers, exposed conduit, primed hardware items, primed outlet covers, primed wall and ceiling plates and other items in painted areas shall be painted to match the areas in which they occur unless otherwise directed by the Architect.
7. Finish doors on tops, bottoms, and side edges the same as faces.
8. Sand lightly between each succeeding enamel or varnish coat.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer over metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

D. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

E. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

F. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and occupied spaces.

1. Mechanical items to be painted include, but are not limited to, the following:

    a. Uninsulated metal piping.
    b. Pipe hangers and supports.
    c. Tanks.
    d. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
    e. Duct, equipment, and pipe insulation having "all-service jacket" or other paintable jacket material.
    f. Supports.
    g. Motors and mechanical equipment.
    h. Accessory items.
    i. Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical items to be painted include, but are not limited to, the following:

    a. Conduit and fittings.
    b. Switchgear.
    c. Panelboards.

d. Electrical equipment that is indicated to have a factory-primed finish for field painting.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

J. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

K. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Primer is not required on shop-primed items.

1. Floropolymer Enamel Finish: Two finish coats over a shop primer.

    a. Primer: Epoxy
    b. Finish Coats: Flournar

B. Zinc-Coated Metal:

1. Full gloss Acrylic Enamel Finish: Two finish coats over a galvanized metal primer.

    a. Primer: Epoxy Intermediate .
    b. Finish Coats: Flournar

C. Aluminum: Provide the following finish systems over exterior aluminum surfaces:

1. Exterior full gloss acrylic Enamel Finish: Two finish coats over a primer.

    a. Primer: Exterior aluminum primer under acrylic finish.
    b. Finish Coats: Exterior full gloss acrylic enamel.

D. Traffic and Parking Lane Marking:

1. Traffic Paint.

3.7 INTERIOR PAINT SCHEDULE

A. Concrete: Provide the following paint systems over interior concrete substrates:

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

    a. Primer: Interior concrete primer.
    b. Finish Coats: Interior semigloss

2. Epoxy Floor Paint Finish: Two coats.

    a. Finish Coats: Interior, epoxy floor paint. Immediately after the placement of the second coat, cast slip resistant sand grit into the epoxy floor paint to provide a coefficient of friction of not less than 0.6.

B. Concrete Masonry Units:

1. Semigloss Acrylic Enamel Finish: Two coats over a filled surface.

    a. Block Filler Coat: High performance latex block filler.
    b. Finish Coats: Interior semigloss acrylic enamel.

C. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish (Ceilings Only): Two finish coats over a primer.

    a. Primer: Interior gypsum board primer.

b. Finish Coats: Interior flat acrylic paint.

2. Low-Luster Acrylic-Enamel Finish (Typical System): Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior low-luster acrylic enamel.

3. Semigloss Acrylic-Enamel Finish (Provide only where scheduled): Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior semigloss acrylic enamel.

4. Epoxy Wall and Ceiling Paint: Two finish coats over a primer.

a. Primer: Interior gypsum board primer.
b. Finish Coats: Interior epoxy wall and ceiling paint.

D. Architectural Woodwork: Provide the following paint finish system over primed architectural woodwork surfaces:

1. Semigloss Acrylic-Enamel Finish: Two finish coats.

a. Finish Coats: Interior semigloss acrylic enamel.

E. Ferrous Metal: Provide the following finish systems over ferrous metal:

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior ferrous-metal primer.
b. Finish Coats: Interior semigloss acrylic enamel.

F. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces:

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

a. Primer: Interior zinc-coated metal primer.
b. Finish Coats: Interior semigloss acrylic enamel.

G. All-Service Jacket over Insulation: Provide the following finish system on cotton or canvas insulation covering:

1. Flat Acrylic Finish: Two finish coats. Add fungicidal agent to render fabric mildew proof.

a. Finish Coats: Interior flat latex-emulsion size.

H. Tug Traffic Lane Marking:

1. Traffic Paint.

3.8 COLOR SCHEDULE

A. Reference to a particular manufacturer's number or color name is used only as a convenience for the Architect in order to establish the Project color requirements. These references are not intended to describe the required generic paint systems. For generic paint systems requirements, refer to the "Schedule of Exterior Painting" and the "Schedule of Interior Painting" as applicable to the respective conditions of use.

B. The selection of paint colors are indicated on the Finish Materials Schedule drawing by manufacturer and color type; designated as "P-__ ".

1. Furnish the same lots, batches, etc. within the same contiguous areas of the building (i.e. corridors on the same floors, common rooms which adjoin each other, etc.).

C. Color Schedule: The color schedule shall be considered as a guide only to color requirements; subject to Architect’s modification or acceptance. For color schedule, refer to Finish Material Schedule on Drawings.

END OF SECTION 09 91 00

SECTION 09 93 00 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and the application of wood finishes on the following substrates:

1. Interior Substrates:
   a. Exposed Glue-Laminated Structural Members and Roof Deck Underside of wood roof decking

1.2 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit EQ 4.2: For interior primers, stains, and transparent finishes, including printed statement of VOC content.

C. Samples: For each finish and for each color and texture required.

D. Product List: Printout of MPI's current "MPI Approved Products List" for each product category specified in Part 2, with the product proposed for use highlighted.

1.3 QUALITY ASSURANCE

A. MPI Standards:

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

B. Mockups: Apply benchmark samples of each finish system indicated and each color selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of finish system and substrate.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
   b. Other Items: Architect will designate items or areas required.

2. Final approval of stain color selections will be based on benchmark samples.

a. If preliminary stain color selections are not approved, apply additional benchmark samples of additional stain colors selected by Architect at no added cost to Owner.

1.4 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. (3.8 L) of each material and color applied.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Material Compatibility:

1. Provide materials for use within each finish 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 finish system, provide products recommended in writing by manufacturers of topcoat for use in finish system and on substrate indicated.

B. VOC Content of Field-Applied Interior Primers, Stains, and Transparent Finishes: 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 primers, stains, and transparent finishes that are applied in a fabrication or finishing shop:
1. Stains: VOC not more than 250 g/L.

C. Stain Colors: See Finish Materials Schedule drawing.

2.2 WOOD FILLERS

A. Wood Filler Paste: MPI #91.

1. VOC Content: E Range of E1.

2.3 STAINS

A. Interior Wood Stain (Semitransparent): MPI #90.

2.4 WATERBORNE ACRYLIC FINISHES

A. Waterborne Clear Acrylic (Satin): MPI #128, Gloss Level 4.

1. VOC Content: E Range of E1.
2. Environmental Performance Rating: EPR 1.

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.

1. Maximum Moisture Content of Wood Substrates: 15 percent when measured with an electronic moisture meter.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes.
3. Begin finish application only after unsatisfactory conditions have been corrected and surfaces are dry.
4. Beginning application of finish system constitutes Contractor's acceptance of substrate and conditions.

3.2 PREPARATION AND APPLICATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Apply wood filler paste to open-grain woods, as defined in "MPI Architectural Painting Specification Manual," to produce smooth, glasslike finish.

C. Protect work of other trades against damage from finish application. Correct damage 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 finished wood surfaces.

3.3 INTERIOR WOOD-FINISH-SYSTEM SCHEDULE

A. Exposed Glue-Laminated Structural Members and Roof Deck (P-03):

1. Semitransparent Stain System:

a. Stain Coat: Cabot interior semitransparent wood stain (see finish schedule).
b. Fire retardant coat: By section 09 96 43

END OF SECTION 09 93 00

SECTION 09 96 43 – FIRE RETARDANT COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes surface preparation and application of fire-retardant coating to interior items and surfaces.

1. Surface preparation, priming, and topcoating application specified in this Section is not to be topcoated by traditional paint coatings. Refer to Section 09 91 00, PAINTING for traditional paint coatings.

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of product indicated.

1. Manufacturer's Information: Provide manufacturer's technical information, including label analysis and instructions for handling, storing, and applying coating materials.

B. Material Test Reports: Submit material test reports for each fire retardant coating.

C. LEED Submittals:

1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.3 QUALITY ASSURANCE

A. Applicator Qualifications: Engage a firm or individual experienced in applying fire retardant coatings similar in material, design, and extent to those indicated for the Project, whose work has resulted in applications with a record of successful in-service performance.

B. Fire-Test-Response Characteristics: Provide fire retardant coatings with the specified surface-burning characteristics as determined by testing identical products per ASTM E 84, by UL, or by another testing and inspecting agency acceptable to authorities having jurisdiction:

PART 2 - PRODUCTS

2.1 FIRE RETARDENT COATINGS

A. Woodwork: Provide the following finish system over all new glue-laminated wood structural elements (interior face of wood roof deck, girders, beams and purlins)

1. Woodwork Indicated to Receive a Stain Finish:

a. First Coat: A water base, fire retardant varnish, with a low semi-gloss sheen. Designed for use on all new or previously coated wood surfaces and will not leach or turn white on aging or washing. The coating shall impart a Class “B” fire rating on wood when applied in two coats at 450 and 700 sq.ft./gallon respectively, and have a V.O.C. of only 0.22 lbs./gallon.

1) Flame Control No. 133; N.Y. Fire-Shield, Inc., Auburn, New York. 800.513.5134, 315.255.1006 or 315.255.2044.

b. Intermediate Coat: Same as First Coat.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements and other conditions affecting performance of work.

1. Proceed with application only after unsatisfactory conditions have been corrected and surfaces to receive the coating are thoroughly dry.

2. Start of coating will be construed as Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

A. General: Remove hardware, hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations on each Atrium construction, space or area, reinstall items removed using workers skilled in the trades involved.

2. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for each particular substrate condition and as specified. Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off. Scrape and

clean small, dry, seasoned knots and treat as recommended by the coating manufacturer before applying the fire retardant coating.

B. Material Preparation: Mix and prepare fire retardant coating materials according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Apply fire retardant coatings according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

END OF SECTION 099643

SECTION 09 96 46 – INTUMESCENT PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes exposed intumescent mastic spray applied fire-resistive coatings as indicated on the drawings.

1.2 SUBMITTALS

A. Product Data: Submit current edition of manufacturer's application and installation instruction manual and referenced bulletins.

B. Shop Drawings: Submit a "Fire-Resistive Materials Design Schedule Keyed to the Structural Drawings and Schedules" indicating the following:

1. Schedule for each building element receiving spray fire-resistive materials showing hourly rating and material thickness and UL Design Number.
2. When UL Designs are used for columns smaller and larger than those listed in the UL Design, provide explanation of thickness adjustment based on W (weight per lineal foot)/D (perimeter of exposure) formulas for each element.
3. Locations and types of surface preparations required before applying sprayed fire-resistive material.
4. Extent of sprayed fire-resistive material for each construction and fire-resistance rating, including a schedule indicating the following:

    a. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.

    b. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components and assemblies.

C. Samples: Submit samples for each type of colored, exposed spray fire-resistive material, two Samples, each 4 inches (102 mm) square, of each color, texture, and material formulation to be applied. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

D. Test Reports: Submit reports of required testing.

E. LEED Submittals:
1. Product Data for Credit EQ 4.2: For paints and coatings, including printed statement of VOC content.
2. Laboratory Test Reports for Credit EQ 4: For paints and coatings, documentation indicating that they meet the testing and product requirements of the California

Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer certified, licensed, or otherwise qualified by sprayed fire-resistive material manufacturer as having the necessary experience staff, and training to install manufacturer's products according to specified requirements. A manufacturer's willingness to sell its sprayed fire-resistive materials to Contractor or to an installer engaged by Contractor does not in itself confer qualification on the buyer.

B. Fire-Test-Response Characteristics: Provide exposed spray fire-resistive material with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction..

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory" acceptable to authorities having jurisdiction, for exposed spray fire-resistive material serving as direct-applied protection tested per ASTM E 119.

2. Surface-Burning Characteristics: ASTM E 84.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination." Review methods and procedures related to exposed spray fire-resistive material including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
2. Review and finalize construction schedule and verify sequencing and coordination requirements.
3. Review weather predictions, ambient conditions, and proposed temporary protections for exposed spray fire-resistive material during and after installation.
4. Review surface conditions and preparations.
5. Review field quality-control testing procedures.

D. Regulatory Requirements: Conform to the applicable building code requirements of the authorities having jurisdiction. Products, execution, and the thickness spray fire resistive materials shall conform to the applicable code requirements for the required fire resistance ratings.

1. UL Degree of Restraint: Unrestrained.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, shelf life if applicable, and fire-resistance ratings applicable to Project.

B. Use materials with limited shelf life within period indicated. Remove from Project site and discard materials whose shelf life has expired.

C. Store materials inside, under cover, and aboveground; keep dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply exposed spray fire-resistive material when ambient or substrate temperature is 40 deg F (4 deg C) or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.

B. Ventilation: Ventilate building spaces during and after application of exposed spray fire-resistive material. Use natural means or, if they are inadequate, forced-air circulation until fire-resistive material dries thoroughly.

1.6 COORDINATION

A. Sequence and coordinate application of exposed spray fire-resistive material with other related work specified in other Sections to comply with the following requirements:

1. Provide temporary enclosure as required to confine spraying operations and protect the environment.
2. Provide temporary enclosures for applications to prevent deterioration of fire-resistive material due to exposure to weather and to unfavorable ambient conditions for humidity, temperature, and ventilation.
3. Avoid unnecessary exposure of fire-resistive material to abrasion and other damage likely to occur during construction operations subsequent to its application.
4. Do not install enclosing or concealing construction until after fire-resistive material has been applied, inspected, and tested and corrections have been made to defective applications.

1.7 WARRANTY

A. Special Warranty: Submit a written warranty, signed by Contractor and by Installer, agreeing to repair or replace sprayed fire-resistive materials that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failures include, but are not limited to, cracking, flaking, or eroding by air or weather, in excess of specified requirements; peeling; and delaminating of sprayed fire-resistive materials from substrates due to defective materials and workmanship.
2. Not covered under the warranty are failures due to damage by occupants and Owner's maintenance personnel, exposure to environmental conditions other than those investigated and approved during fire-response testing, and other causes not reasonably foreseeable under conditions of normal use.

B. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 EXPOSED INTUMESCENT MASTIC FIRE-RESISTIVE COATING

A. Weather Exposed (Exterior) Product: Fire-Resistive, Water-Based, Intumescent Mastic Coating Material System:

1. Basis of design Manufacturer: Tnemec/ Leighs FireTex M90 or approved equal

2. Mastic Coating: A two component pack, solvent based intumescent coating designed to protect exterior structural steel members meeting UL 1709 Exterior Criteria Must meet NORSOK Exposure Test REV 5. and Blast Resistance per Homeland Security requirements of 4 Bar

   a. Tnemec / Leighs Firetex M90

3. Topcoat: A aliphatic acrylic polyurethane compatible with and adherent to the specified intermediate coating.

   a. Tnemec 1075 Endurashield

B. Non-Weather Exposed (Interior) Product: Fire-Resistive, Water-Based, Intumescent Mastic Coating Material System:

1. Manufacturer: Tnemec/ Leighs Firetex

2. Mastic Coating: A single pack, solvent based intumescent coating designed to protect interior structural steel members.

   a. Firetex Intumescent Coating Firetex 263

3. Topcoat: An acrylic urethane compatible with and adherent to the specified intumescent coating.

   a. Tnemec 1029 Enduratone

   Tnemec is cited to establish standard of quality and performance equal manufacturers of PPG or International will be considered should they meet the fire and durability performance of the specified materials .

2.2 AUXILIARY FIRE-RESISTIVE MATERIALS

A. General: Provide auxiliary fire-resistive materials that are compatible with exposed spray fire-resistive material and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.

B. Substrate Primers: For use on each substrate and with each sprayed fire-resistive product, provide primer that complies with one or more of the following requirements:

1. Primer's bond strength complies with requirements specified in UL's "Fire Resistance Directory" for coating materials based on a series of bond tests per ASTM E 736.
2. Primer is identical to those used in assemblies tested for fire-test-response characteristics of exposed spray fire-resistive material per ASTM E 119 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by manufacturer of exposed spray fire-resistive material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with installer and representative of the testing laboratory present, to determine that they are in satisfactory condition to receive sprayed fire-resistive material. Contractor, Installer and testing laboratory shall submit written statement of each area’s substrate acceptability to the Architect prior to beginning application of fire-resistive materials. A substrate is in satisfactory condition if it complies with the following:

1. Substrates comply with requirements in the Section where the substrate and related materials and construction are specified.
2. Substrates are free of dirt, oil, grease, rolling compounds, mill scale, loose scale, incompatible primers, incompatible paints, or other foreign substances capable of impairing bond of fire-resistive materials with substrates under conditions of normal use or fire exposure.
3. Objects penetrating fire-resistive material, including clips, hangers, support sleeves, and similar items, are securely attached to substrates prior to application.

B. Conduct tests according to fire-resistive material manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.

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

3.2 PREPARATION

A. Cover other work subject to damage from fallout or overspray of fire-resistive materials before application. Provide temporary enclosure as required to confine spraying operations, protect the

environment, and ensure maintenance of adequate ambient conditions for temperature and ventilation.

B. Clean substrates of substances that could impair bond of fire-resistive material, including dirt, oil, grease, release agents, rolling compounds, loose mill scale, and incompatible primers, paints, and other foreign substances which may impair proper adhesion of fireproofing to substrate.

C. Prime substrates where recommended in writing by exposed spray fire-resistive material manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive exposed spray fire-resistive material.

D. For exposed applications, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of exposed spray fire-resistive material. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION, GENERAL

A. Comply with fire-resistive material manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and spray on fire-resistive material, as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.

B. Install reinforcing fabric, as required, to comply with fire-resistance ratings and fire-resistive material manufacturer's written recommendations for conditions of exposure and intended use.

C. Extend fire-resistive material in full thickness over entire area of each substrate to be protected. Unless otherwise recommended in writing by exposed spray fire-resistive material manufacturer, install body of fire-resistive covering in a single course.

D. Spray apply fire-resistive materials to maximum extent possible. Following the spraying operation in each area, complete the coverage by placement method recommended in writing by exposed spray fire-resistive material manufacturer.

E. Apply intumescent mastic fire-resistive coating as follows:

1. Install reinforcing fabric as required to obtain designated fire-resistance rating and where indicated.
2. Finish: Spray-textured.

F. Intermediate Coating (Exterior Applications Only): After the intumescent mastic fire-resistive coating has dried, apply one coat of intermediate coating to a minimum dry film thickness of 0.002 inch. Apply topcoats required by UL Listing or if specified under 09900 Painting.

G. Top Coating: After the intumescent coating, and intermediate coating (where applicable) has dried, apply one coat of top coating to a minimum dry film thickness of 3.0-4.0 mils DFT

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to verify the adequacy of the Contractor's quality control of the sprayed-fire resistive materials work.

1. The independent testing and inspection agency will promptly submit weekly test results to the Contractor and Architect. The reports shall clearly indicate the location of each test, the test result at that location, and whether or not the tested fire resistive materials at each test location complies with the Contract Documents.

B. Testing and Inspection: Testing and inspection of completed applications of sprayed fire-resistive material shall be conducted as the work progresses. Each thickness, density and bond strength test location shall be selected at random by the testing and inspection agency. Do not proceed with application of sprayed fire-resistive material for the next area until test results for previously completed applications of sprayed fire-resistive material show compliance with requirements.

C. Apply additional sprayed fire-resistive material per manufacturer's written instructions where test results indicate that thickness does not comply with specified requirements.

D. Remove and replace, at Contractor's expense, including costs of delays to the work caused by removal and replacement, sprayed fire-resistive material where test results indicate that they do not comply with specified requirements for both cohesion and adhesion and for density.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.5 CLEANING, PROTECTING, AND REPAIR

A. Cleaning: Immediately after completing spraying operations in each confinable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces.

B. Protect sprayed fire-resistive material, according to advice of product manufacturer and Installer, from damage resulting from construction operations or other causes so fire protection will be without damage or deterioration at time of Substantial Completion.

1. Trades, other than fireproofing installer, who remove fireproofing material will be responsible for replacement of same.

C. Coordinate application of sprayed fire-resistive material with other construction to minimize need to cut or remove fire protection. As installation of other construction proceeds, inspect sprayed fire-resistive material and patch any damaged or removed areas prior to covering by other construction.

END OF SECTION 09 96 46

SECTION 09 97 23 - CONCRETE AND MASONRY COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes a sealing compound applied to concrete surfaces.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's specifications, application instructions, and general recommendations. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. LEED Submittals:

1) Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2) Product Data for Credit EQ 4.2: For paints, including printed statement of VOC content and chemical components.

1.3 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels.

B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer.

1.4 PROJECT CONDITIONS

A. Environmental Requirements: Do not proceed with installation until areas to receive the work have been enclosed and until temperature and relative humidity have been stabilized and will be maintained within values established by the manufacturer for optimum quality control.

B. Ventilation: Provide adequate ventilation to prevent accumulation of hazardous fumes, if any, during application of concrete floor sealer in enclosed spaces, and maintain ventilation until sealer has cured.

PART 2 - PRODUCTS

2.1 CONCRETE SEALERS

A. CS-01: A penetrating, VOC Compliant, low odor, hardening, sealing and dustproofing compound with a maximum water absorption of 3.4% in 24 hours per ASTM C642, and a minimum water vapor transmission rate of 317 grams/s.f. per 24 hour period, and a specific gravity of approximately 1.2.

1. "Day-Chem Sure Hard (J-17)"; Dayton Superior Specialty Chemical Corp.

B. CS-02: Anti-graffiti coating meeting the following requirements: Active Content: Organofluorosilane. Solvent: None, water-borne. VOC Content: less than 100 grams per liter. Cleaning Cycles: Non-sacrificial: minimum 8 to 10 cleaning cycles without reapplication. Breathability: Greater than 95% water vapor transmission. Surface Appearance: No appreciable difference compared to non-coated surface. Excellent Ultraviolet light stability.

1. Protectosil Anti-Graffiti, Degussa A&S Division 1-800- 828-0919.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation properly may commence. Do not proceed with the work until unsatisfactory conditions have been resolved fully.

3.2 PREPARATION

A. Clean substrate, removing projections and substances detrimental to the work; comply with recommendations of manufacturer of products to be installed for proper preparation procedures.

B. Mask off or otherwise protect adjacent surfaces not scheduled to receive products of this section.

3.3 APPLICATION

A. General: Comply with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

3.4 PROTECTION

A. General: Institute protective procedures and install protective materials as required to ensure that work of this section will be without damage or deterioration at substantial completion.

END OF SECTION 09 97 26

SECTION 10 14 00 - SIGNAGE

1.0 SECTION INCLUDES

A. Description of all materials, fabrication standards, and installation services for the sign system defined within the Design Intent Documents sheets A07.00.01 through A07.12.07.

GENERAL

A. Substitutions: In order to substitute materials or methods, prior approval must be obtained at least 72 hours before bid opening. Approved substitutions shall be shared with other bidders. After execution of the contract, all substitutions shall be governed by the Specifications.

B. Approvals: All submittals and articles of any kind necessary for the work are subject to approval by Project Architect and Owner.

C. Coordination: The Sign Fabricator will coordinate on-site work, electrical service and final sign placement with the Construction Manager for each parcel of land. Where structural support for signage is required, it shall be provided and installed by the Sign Fabricator, and all adjacent landscaping repaired as required.

D. Sign Definitions, Descriptions And Characteristics: Refer to Design Intent Documents, Message Schedule and Sign Location Plans for precise definition and proposed message of each sign.

E. Time Of Completion: Sign Fabricator shall complete all work in accordance with schedule milestones. All activities shall be sequenced to coordinate with field progress.

F. Pre-Construction Conference: A pre-construction meeting will be held with representatives from Owner, Sign Fabricator and Project Architect to establish the procedure for communication and coordination with the General Contractor or Construction Manager and subsequent trades.

G. Field Measurements: Measure in-place any existing construction as needed for fabrication and execution. No changes to fees or schedule will be allowed for differences between Design Intent dimensions and field measurements.

H. Electrical Service: Requirements shall be determined as soon as possible. Electrical service must be coordinated with service available at each sign location. Service may vary according to location. Only new electrical components and respective lamps shall be utilized. Reasonable access for maintenance of components and lamps is required.

I. Instruction: Prior to acceptance, establish with Owner an instruction and training program for Owner personnel. Notify Owner in writing at least seven (30) days prior to commencement of the program by providing an outline of topics indexed to the Maintenance and Operating Manual. Provide a trained instructor. Instruction and training shall include, but are not limited to, procedures to be followed in the normal day-to-day maintenance and operation of the work.

J. Permits: Sign Fabricator shall make all submittals for permits; shall be responsible for paying all fees, making adjustments as required, or any task necessary for obtaining local building and installation permits for the proper execution of the work. All such permits must be obtained prior to fabrication of the sign item. Copies of all permits shall be delivered to the Owner.

K. Markings and Labels: Visible labels are not allowed except as required. When necessary, locate markings, labels, manufacturer names and other identifications so as to be concealed from public view.

L. Final Location Of Signs: The location of signs as shown on the Sign Location Plans is for general reference only and in some cases is not representative of the exact final location. Final locations of signs shall be field located in coordination with Project Architect and Owner at the site. Sign Fabricator shall arrange for meetings at the site to accommodate direction of final locations according to project schedule.

M. Discrepancies: Any discrepancies in the drawings or graphic message schedule, in field dimensions or conditions and/or changes required in construction details shall be resolved by Project Architect. Sign Fabricator shall advise Project Architect as these conditions are discovered. Sign Fabricator shall not resolve these issues independently.

N. Rights to Design: Sign Fabricator may not manufacture, reproduce, or exhibit these designs, or modify them for any other purpose outside of this current contract without written approval of Project Architect and Owner.

0. Structural Documents: Provide signed and sealed drawings for structural components as required.

1.2 RELATED SECTIONS

A. Section 14 "Electric Traction Elevators and Hydraulic Elevators" for code required elevator signage.

B. Section 23 "Mechanical Identification" for labels, tags, and nameplates for mechanical equipment.

C. Section 26 "Electrical Identification" for labels, tags, and nameplates for electrical equipment.

D. Section 26 "Interior Lighting" for illuminated exit signs, electrical service, connections for illuminated characters, and access to remote transformers.

1.3 REFERENCES

A. Comply with requirements of Section 01 33 00.

B. International Building Code

C. National Association of Architectural Metal Manufacturers (NAAMM) "Metal Finishes Manual."

D. American Welding Society (AWS): AWS D1.1 "Structural Welding Code, Steel," and AWS D1.2 "Structural Welding Code, Aluminum".

E. Underwriters Laboratories Inc. (UL): Standards for Safety, UL Publication 48 "Electric Signs."

1.4 SUMMARY OF WORK

A. Sign Fabricator will be held to furnish, all work as specified in the Design Intent Documents, Specifications, Message Schedule, and Sign Location Plans as provided by Project Architect. All fabrication, installation, structural engineering, schedule and sequence coordination, anchor and support devices, work process and product of subcontractors, and all accessories required in order to produce the complete sign system described.

B. Scope of work includes but is not limited to the following:
a. Exterior signs with permanent foundations, including site preparation and restoration in the immediate work areas.
b. Exterior signs coordinated with and attached to architectural elements and other features specified by others.
c. Roadside regulatory signs placed according to direction of applicable federal and state departments of transportation and other authorities having jurisdiction at the site.
d. Exterior signs mounted to the face of existing structures at varied heights above finish grade. Work to be coordinated with the project construction sequence, project schedule and other trades as directed.
e. Interior overhead and wall mounted signs attached to in-place sub-surface anchors and blocking provided by others. Verify sub-surface anchor locations on site.
f. Interior sign panels with electronic displays. Coordinate fabrication and installation to ensure compatibility of sign cabinet with electronic display and with recessed wall areas for each sign location. Verify size and condition of recessed areas on site.
g. Interior signs applied to various substrates with adhesives, mechanical fasteners or both as required by weight, surface materials, moisture conditions, and durability considerations.

1.5 SUBMITTALS

A. Shop Drawings: Furnish plans, elevations, sections, and details of fabrication and erection for all items outlined in Design Intent Documents. Include all materials, shapes, dimensions, finishes, mounting heights, method of anchoring and connections, and mounting methods. Provide notations for reinforcement, structural members, supports, surfaces, finishes, materials, and accessories.

B. Sign Layouts: Provide full-scale layouts for each sign type including text, symbol artwork, Type 2 Braille, and any other graphic elements as solid black with sign face outlined. Provide scaled layouts for all signs. All Sign Layouts should indicate the following: complete layout including proper character spacing and heights; dimensions of all layout elements relative to the sign panel and to one another; exact typeface and letterspacing.

C. Electrical: Provide wiring diagrams and electrical load requirements for signs with illuminated characters, panels or faces.

D. Schedule: Submit a project schedule that conforms to project occupation and opening dates. Include submittals, review, production milestones, shipping, on-site preparation, installation and follow-up.

E. Materials Samples: Submit per schedule, for approval. Provide 3 SETS of 10" x 10" non-returnable samples of all materials, colors, and finishes as specified. Provide 3 COMPLETE SETS of all exposed hardware and fasteners to be used.

F. Extra Materials: Deliver to Owner, in manufacturer's original packaging and store at the project site where directed: one (1) gallon of each finish paint color for touch-up purposes; six (6) lamps of each type/model and size used; one (1) cooling fan of each type/model and size used; and one (1) ballast of each type/model and size used. Provide paint formula index for every color used. Provide packaging and protection for extended storage. Deliver to the owner, all molds or forms used to produce signs.

G. Supplementary Product Literature: Submit manufacturer's literature describing the general properties of each product to be used.

H. Structural Calculations: Provide drawings with engineers stamp for engineer registered in the state where work is to be installed. Provide exterior sign assemblies designed, tested, and installed to withstand positive and negative wind loads per site specific code requirements as determined by a licensed professional structural engineer, registered in the State of Maine. Furnish engineering calculations to show that maximum stresses and signage support system, do not exceed specified performance requirements under full design loading. Limit deflections on signage members under full wind loading to 1/4-inch. Calculations shall be prepared and sealed by a structural engineer licensed in the State of Maine.

I. Qualification Data: For installer, suppliers, and subcontractors. Describe nature and extent of project involvement of each. Use standard AIA form. Qualification Data must be provided ten (10) working days prior to commencement of work. Relevant sign types for each must be referenced.

J. Signing Warranty: Submit to Client for Owner's documentation, a 5 year written warranty (effective the date of final acceptance) covering all signs, signed by the Sign Fabricator and Installer, agreeing to repair or replace work which has failed as a result of defects in materials or workmanship or installation. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of Owner.

K. Linear Polyurethane Paint Factory Finish Warranty: Submit to Construction Manager for Owner's documentation. Furnish 5 year written warranty, warranting that the factory-applied linear polyurethane finishes will not develop excessive fading or excessive non uniformity of color or shade, and will not crack, peel, pit, corrode or otherwise fail as a result of defects in materials or workmanship within the following defined limits. Upon notification of such defects, within the warranty period, make necessary repairs or replacement at the convenience of Client.
a. "Excessive Fading": A change in appearance, which is perceptible and objectionable as determined when visually, compared with the original color range standards.
b. "Excessive Non-Uniformity": Non-uniform fading to the extent that adjacent panels have a color difference greater than the original acceptable range of color.
c. "Will Not Pit or Otherwise Corrode": No pitting or other type of corrosion, discernible from a distance of 10' (3m), resulting from the natural elements in the atmosphere at the project site.

L. Maintenance and Operating Manuals: Submit two (2) copies for Owner's documentation and one (1) copy to Project Architect. Furnish complete manuals describing the materials, devices and procedures to be followed in operating, cleaning and maintaining the work. Include manufacturers' brochures and parts lists describing the actual materials used in the work, including metal alloys, finishes, electrical components and other major components. Include in the manual samples of all vinyls or films used, samples of all paints used, and all paint formulas used. Assemble manuals for component parts into single binders identified for each system.

1.6 QUALITY ASSURANCE

A. Mock-ups and Prototypes: Provide a mock-up (partial for large signs; complete for smaller signs) of all sign types. Utilize the same materials and installation methods in the mock-up as intended for the final work. Schedule the installation so that the mock-up may be examined, and any necessary adjustments made, prior to commencing fabrication of the final work. Replace unsatisfactory items as directed. When accepted, mock-up shall serve as the standard for materials, workmanship, and appearance for such work throughout the project. Approved samples will not be returned for installation into project.

B. Work-In-Progress Approvals: Scheduled or unscheduled viewings at the shop or factory may be initiated as deemed necessary to ensure continued quality control and make any adjustments required during fabrication. Unsatisfactory items are to be corrected by the Sign Fabricator as directed. All subcontractors shall be identified; contact names, numbers and addresses shall be provided with reference to sign types they will be fabricating.

C. Source Limitations: Obtain each material type, shape or size from one source from a single manufacturer.

D. Materials: Cut all required faces, trim, or continuous surfaces from a single piece of base material unless overall size cannot be obtained from a single piece due only to its size. Materials shall be new, un-used in any previous work, free of imperfections of surface, substance, manufacture, or damage from shipping or handling. Materials shall be utilized in the fabrication process only for the purpose intended by the original manufacturer or supplier.

1.7 REGULATORY REQUIREMENTS

A. Comply with applicable requirements of the laws, codes, ordinances and regulations of Federal, State and Municipal authorities having jurisdiction, include state and federal ADA requirements as applicable. Obtain necessary approvals and permits from all such authorities as required.

B. Interior Code Signage: Provide signage as required by accessibility regulations and requirements of authorities having jurisdiction. These include, but are not limited to, the following:
a. Fire Doors: Fire Marshal, Portland, Maine.
b. Room Capacity: Fire Marshal, Portland, Maine.
c. Elevator Signs: Building Department, Portland, Maine.

d. Stairway Identification: Fire Marshal, Portland, Maine.
e. Live Load Capacity: Fire Marshal, Portland, Maine.
f. Signs for Accessible Spaces: Building Department, Portland, Maine.
g. Electrical signs: UL Listed components as required

1.8 QUALITY OF WORKMANSHIP

A. Sign Fabricator: The Sign Fabricator shall be responsible for the quality of all materials and workmanship required for the execution of this contract including materials and workmanship of any firm or individual who act as Sign Fabricator's sub-contractor. Sign Fabricator shall be responsible for providing up-to-date drawings, specifications, graphic schedule, etc., to all sub-contractors. Sign Fabricator shall provide a supervisor who will be assigned for the duration of the project.

B. Installer Qualifications: Sign Fabricator shall provide workers trained and supervised by signage manufacturer. An authorized representative from the Sign Fabricator shall be present for the duration of the on-site installation.

C. Fabrication Qualifications: Fabrication and installation shall be conducted by trained individuals working under the direct and continual supervision of the Sign Fabricator or sub-contractors as disclosed on the bid form. All materials shall remain under the direct control of the Sign Fabricator or his disclosed sub-contractors during the entire fabrication and installation process.

D. Templates: Templates will be required for certain sign items noted on design drawings. Templates must be created only after complete installation of finish surfaces to receive installed sign.

E. Sign Locations: Sign locations shall accommodate full door swing where applicable, in addition to required mounting height and position requirements.

F. Dimension: Written dimensions on drawings shall have precedence over scaled dimensions. Sign Fabricator shall verify and be responsible for all dimensions and conditions shown by these drawings. Shop details must be approved prior to fabrication.

2.0 PRODUCTS

2.1 CHARACTERS AND LETTERING
A. The Sign Fabricator shall be responsible for the quality control of all characters and lettering. All characters shall be crisp, sharp, free of nicks, ragged edges and discontinuous curves. Letterforms with burrs, saw marks, rounded positive or negative corners, nicked, cut, or ragged edges, etc., will not be accepted. All letterforms shall be so aligned as to maintain a baseline parallel to the sign format unless otherwise indicated in the Design Intent Documents. Margins must be maintained as specified in Design Intent Documents.

B. All characters and lettering shall conform to approved typeface, weight and letterspacing. No substitutions of typeface foundry, brand or version or implementation technique will be accepted without prior approval.

C. Cast Characters: Form individual letters and numbers by casting. Produce characters with smooth flat faces, sharp corners, and precisely formed lines and profiles, free from pits, scale, sand holes, and other defects. Cast lugs into back of characters and tap to receive threaded mounting studs.

D. Cutout Characters: Cut characters from solid plate of thickness and metal indicated. Produce precisely cut characters with square cut, smooth edges.

E. Fabricated Characters: Fabricate letters and numbers to required sizes and styles, using metals and thickness indicated. Form exposed faces and sides of characters to produce surfaces free from warp and distortion. Include internal bracing for stability and attachment of mounting accessories.

2.2 ILLUSTRATION, PHOTOGRAPHY, IMAGERY, ARTWORK AND OTHER GRAPHICS

A. Vinyl Die Cut Graphics: All precision machine-cut vinyl typography or graphics shall be executed in such a manner that all edges and corners of finished letterforms are true and clean. Cut-out characters from vinyl film of nominal thickness of 3 mils (0.076 mm) with pressure-sensitive adhesive backing. Apply copy to exposed face of panel sign, or glass surfaces. Apply protective, ultraviolet-inhibiting, clear coating to vinyl characters applied to any painted surface. The application of all vinyl characters shall be smooth, free of air bubbles, ridges, creases, distortion or other imperfections. Application technique must follow manufacturers recommendations. Surface coating shall dry for a minimum 4 days (medium humidity) prior to application of vinyl graphics. Avoid air pockets caused by out-gassing or curing of the base coating upon which self-adhesive vinyl is applied.

B. Artwork and Imagery: All artwork shall be digitally generated or scanned, high-resolution images.

C. Silk-Screening: Photo-silk-screened images shall be sharp without serrated or irregular edges, exactly true to the letter and design form. Silk-screened images shall be applied to the base surface within 72 hours of base surface coating application.

2.3 SIGN MATERIALS

A. Adhesives: Contact adhesive or foam tape, shall be used in conjunction with silicone adhesives for installation of wall signs, in minimum thicknesses required. Use vertical bands of double-sided foam tape to mount signs to smooth, nonporous surfaces. Do not use this method for vinyl-covered or rough surfaces unless otherwise indicated. Use liquid-silicone adhesive recommended in writing by sign manufacturer to attach signs to irregular, porous, or vinyl covered surfaces. Use double-sided vinyl tape where recommended in writing by sign manufacturer to hold sign in place until adhesive has fully cured.

B. Metals, General: Standard thickness for all sheet/panel surfaces shall be .125" minimum unless otherwise noted. Contractor shall recommend and use material thickness sufficient to prevent any waviness, "oil canning" or warping of the surface. Remove tool and die marks and stretch lines or blend

into finish. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece. When polishing, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Metals, Aluminum: Aluminum shall be suitable for ornamental, architectural work. Surface finish shall be smooth, free of extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of the specific application. Aluminum shall not directly contact any other materials. Contact surfaces are to be insulated with a zinc-chromate coating, bituminous paint, or a gasket.

D. Metals, Stainless Steel: Stainless steel shall be suitable for ornamental and architectural work. Surface finish shall be smooth, free of all extrusion marks or imperfections. Alloy shall be selected to meet the structural requirements of specific application.

E. Metals, Structural: Structural metal for concealed framing shall be of galvanized rolled steel or equal as required to satisfy structural requirements.

F. Acrylic Sheet Plastic: Use Plexiglas II as manufactured by Rohm and Haas Co., or equal. Thickness shall be as indicated on drawings or not less than 1/8" thick. Contractor shall provide color and finish samples of all plastics for approval before fabrication; no substitution in color, thickness, or finish of plastics will be accepted without written approval. All plastics shall be of uniform color, translucence and illumination, as supplied by manufacturer. Any exposed edges of acrylic shall be finished so as no saw marks are visible. Sheet materials indicated as "clear" shall be supplied as colorless sheet.

G. Tactile and Braille Copy: Manufacturer's standard process for producing copy conforming to ADA Accessibility Guidelines. Text shall be accompanied by Grade 2 Braille.

H. Flexible Sign Face Substrate: All substrate shall be of uniform color, translucence and thickness, as supplied by manufacturer. Any exposed edges of substrate shall be finished so as no saw marks are visible.

I. Concrete: Installation of anchoring devices into concrete slab shall be adjusted to avoid penetrating existing reinforcing conduit, etc. contained in the concrete slab.

J. Decal or Transfer: Printed paper or vinyl suitable for reproducing the design onto material indicated, shall be used as required.

K. Fasteners: Bolts, nuts, screws, washers, anchors and other devices required to complete the work. Same basic metal or alloy as the metal fastened, and finished to match in color and texture. Stainless steel alloy shall be used to join dissimilar materials. Use of exposed fasteners is prohibited unless otherwise indicated on the design drawings. Use of fasteners, anchors, adhesives and other attachments shall be in accordance with requirements and recommendations of the manufacturer of the device or material.

L. Fiberglass Reinforced Polyester (FRP) Construction: Custom engineered one-piece seamless FRP monolith consisting of initial gel coat sealing layer with multilayers of (translucent) thermoset polyester resin and (translucent) glass fiber strands molded in forms maintaining module configuration to 0.125 minimum thickness with 3/16" radius all edges. Core material shall be fully encapsulated resin impregnated honeycomb (expanded foam) as required. All FRP signs shall be finish coated with UV inhibitors and crystal clear matte polyurethane sealers. Sign Fabricator to provide Client with instructions

for maintenance and waxing of FRP signs. In the case of internally illuminated FRP signs, core will be hollow within structural frame to secure FRP molded panels and house illumination fixtures.

M. Foam Tape: Provide concealed black polyurethane foam tape or "Isotac" laminate tape as manufactured by 3-M, applied to sign elements as required.

N. Hardware/Hinges: Provide and install all incidental hardware necessary for the proper functioning of the signs, including but not restricted to materials and products covered in this section. Provide stainless steel hinges for all hinged access panels. Provide pin tumbler locks for all access panels requiring locks.

O. Insulation: Separate all ferrous and non-ferrous metals with non-conductive gaskets to prevent electrolysis. In addition to gaskets, provide stainless steel fasteners for some cases as required.

P. PVC Tubing: Provide PVC (polyvinyl chloride/plastic) tubing in thickness and strength suitable for signage as specified. Surfaces should be smooth and clean for application of painted finishes and vinyl graphics. Mount/secure as indicated on drawings (suspended).

Q. Welding Electrodes and Filler Metal: Provide the alloy and type required for strength, workability, compatibility and color match after grinding smooth and finishing the fabricated product.

R. Silk Screening Materials: Provide photo processed screening, arranged to furnish sharp and solid images without edge build up or bleeding of the coating. Pattern-cut screens may be used for non-repeat copy, provided that final image copy is equal to photoscreen quality. Provide only weather-resistant coating materials, compatible with the intended substrates.

S. Vinyl Die-Cut And Pattern Cut-Out Graphics: Use pressure-sensitive, non-yellowing, non-peeling and weather resistant vinyls as specified. Use approved fonts and equipment as specified.

2.4 ELECTRICAL COMPONENTS

A. Wiring and Equipment: Provide and install electrical materials such as ballasts, transformers, lamps, sockets, neon units, connectors, and all other equipment. All equipment shall be new and shall be approved by Underwriters Laboratories, Inc. The assembly of all components within the illuminated signs shall conform to current Underwriters Laboratories, Inc. standards. All wiring and equipment shall be concealed within the sign structure unless otherwise instructed.

B. Transformers: Coordinate location of remote transformers with building construction. Ensure that transformers are accessible after completion of work. Transformers and electrical hardware shall be concealed, non-audible and nonvisible to pedestrian and vehicular traffic in the immediate area of the completed installation. No electrical controls or devices are to be attached to any sign face or support unless required by local authorities having jurisdiction

C. Exterior Sign Locations: Electrical components for exterior sign locations shall be suitable for wet location and certified by the manufacturer.

D. Conduit and Devices: Provide rigid steel conduit, junction boxes and associated devices in accordance with applicable codes as required.

E. Wiring: Minimum #12 AWG copper. High tension wiring shall not be less than GTO 15 wire as manufactured by Carol Cable company or approved equal. All wiring shall be AWM 90 0 centigrade 1000 volt TW/MTW U.L. file no. 18971. Wiring connectors for wire splicing shall be U.L. approved 1000 volt capacity. They shall be Scotch Lock type Y or R or equal. All splices shall be placed as to easily access for inspection.

F. Ballasts: As required for internally illuminated cabinet signs, in quantity and arrangement as recommended by ballast manufacturer; accessible for maintenance.

G. Disconnect Switch: All signs or sign components with electrical service shall be equipped with an approved external disconnect switch, flush mounted on the cabinet/sign, with circuits and capacity to control all primary wiring within the sign. Location of switch must be shown on shop drawings and is subject to approval.

H. Illumination: All signs with fluorescent fixtures shall utilize minimum 800 miliamp T12 output cool white fluorescent lamps at the length and placement necessary to provide even illumination without light leaks. All lamps and ballasts shall be provided by the Sign Fabricator. Provide waterproof flush access panel(s), concealed wherever possible. Conduit wiring and electrical equipment from the field electrical connection to any part of the sign and within the sign shall be provided by the Sign Fabricator.

2.5 ILLUMINATION

A. Internal or External Illumination: Unless otherwise indicated lighting fixture/source must emit a color-balanced, consistent and uniform light effect with no browning, flickering, haloing, or other uneven effect. No "hot" or "cool" spots will be acceptable. Homogenous illumination is required.

B. Illuminated Characters: Illuminate characters in manner indicated. Make provisions for servicing and concealing connections to building electrical system. Coordinate electrical characteristics with those of power supply provided.

C. Ventilation: While maintaining a proper weather seal, provide for sufficient ventilation of sign components to prevent overheating or warpage; allowing for color of sign, mounting surface, climate conditions, etc. In providing for ventilation, protect sign from elements (rain, wind, debris, etc.) that might cause operational or cleaning problems. Signs/cabinets with light leaks will not be accepted.

D. Neon: Form neon tubing as required, using tubes individually filled at optimum pressure required for uniform lighting. Buttress threaded glass posts, securely attach tubes to supports with pure annealed copper wire ties, without strain on tubing.

2.6 FINISHING MATERIALS

A. Painted surfaces are to be catalyst hardened acrylic polymer using a base clear coat system. Coatings shall not crack, peel, craze, discolor, or fade under ultra-violet light conditions.

B. Coatings shall be compatible with the surface to which they are applied. Finish applications are to be smooth and uniform, free of "orange-peel" or other irregularities, applied according to manufacturer's recommendations.

C. Color breaks on sign surfaces shall be sharp, without serration or color bleed or shadows. All drips, splatters and over sprays shall be removed.

D. Brushed and satin finished aluminum surfaces are to be consistent and uniform among all the signs of the system.

E. Coatings shall accurately match the colors specified or color swatches furnished by the Designer.

F. Clear Sealers: Crystal clear matte polyurethane sealers By Matthews Paint Co. or approved equal. Sealers are to resist rust and corrosion associated with exposure to salt air. As required and of highest quality available, applied per manufacturer's specifications.

G. Protection: Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

H. Variations: Variations in appearance of abutting or adjacent pieces are not acceptable. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are not acceptable.

I. Anodized Aluminum Components/Panels: If required provide anodized (application of aluminum oxide film coating in clear or colored dye finish) aluminum panels or parts to match specified color, grain, finish and specifications.

2.7 FABRICATION OF SIGNS AND SUPPORTS

A. General: Provide custom manufactured sign assemblies, components completely fabricated and finished at factory before delivery to site. Construct to accurate detail and dimensions as shown in Design Intent Documents and as reviewed on shop drawings. Fit and assemble the work at shop to the greatest extent possible, and mark the components as required to facilitate assembly during installation. Fabricated and assembled materials, prior to painting and finishing shall be free of imperfections, roughness, burrs, open joints, misalignment of components, surface irregularities, pits, piping, or any other substandard feature or condition.

B. Seams and Joints: Added joints shall be ground filled and finished flush and smooth with adjacent work. Such seams shall be invisible after final finish has been applied. Spot welded joints shall not be visible on exterior of signs after final finish has been applied. No gaps, light leaks, waves, or oil canning will be permitted in work.

C. Metal Signs and Supports: Fabricate exposed surfaces uniformly flat and smooth, without distortion, pitting, or other blemishes. Form exposed metal edges to a smooth radius. Permanently bond the laminated metal components and honeycomb core with adhesive or sealant in accordance with product manufacturer's recommendations. Grind exposed welds and rough areas to make flush with adjacent smooth surfaces.

D. Castings: Exposed surfaces shall be uniformly free from porosity, roughness, pits, sand holes, and other defects. Edges filled and ground smooth. Faces chemically etched and mechanically polished for specified finish. Castings shall be of alloy and temper recommended
by sign manufacturer for casting process used and for type of use and finish indicated. Concealed studs will be used unless otherwise indicated.

E. Galvanizing: Provide for steel components in exterior construction, and where noted to be galvanized. Complete the shop fabrication prior to application of the zinc coating. Remove mill scale and rust, clean and pickle the units as required for proper pretreatment of the surfaces.

F. Hardware: Provide all incidental hardware necessary for the proper functioning of signs. External hardware shall conform to the external appearance of the sign.

G. Support, Backing and Blocking: Sign Fabricator shall provide engineered sign supports anchored to building structure where required and to meet requirements of applicable building codes. Support or backing requiring installation within the building wall construction shall be immediately relayed to the Owner for field coordination. Furnish templates for installation of anchorage devices.

2.8 SHOP APPLICATION OF SIGN FINISHES

A. Sign Graphics: Provide the letters, numerals, symbols, and other graphics markings, using the finish materials shown. Apply the graphics neatly, uniformly proportioned and spaced, and accurate within the dimensions indicated. Prepare the substrate surfaces and apply finish materials in accordance with manufacturers' instructions.

B. Metal Finishes: Remove scratches, abrasions, dents and other blemishes before applying finish. Apply relevant finishes to the fabricated work, with texture and reflectivity as specified in Design Intent Documents.

C. Linear Polyurethane Finishes: Clean the surfaces as required for proper adhesion of coatings. Use cleanser and water, and/or chemically treat as recommended by paint manufacturer to remove deleterious film or residue. Provide pretreatment and primer in accordance with manufacturer's recommendation.

2.9 GRAPHIC APPLICATION

A. Preparation: Surfaces to receive the graphic markings shall be clean, dry, and otherwise made ready for application of the materials. Accurately measure and lay out the required marking configurations as indicated on drawings.

B. Vinyl Die-cut and Pattern-cut Graphics: Use die cut, pressure sensitive, non-yellowing, non-peeling and weather resistant vinyl adhesive letters or images, custom flood coated as required. Apply in strict accordance with manufacturer's instructions. Make uniformly smooth and free from bubbles, wrinkles, stretching and blemishes.

C. Painted or Silk-screened Graphics: All graphics to be applied using photo processed screens from camera ready art, arranged to furnish sharp and solid images without build-up or bleeding of the coating. Comply with coating manufacturer's application instructions. Provide proper type of primer to suit each substrate and obtain a permanent bond. Verify compatibility of each substrate with the coatings to be used in the work. Apply the markings with neat edges, minimum thickness and as required to obtain solid markings without voids.

D. Acid-Etched Graphics and Typography: Acid-etched typography and graphic imagery must be clean, crisp, sharp edges; ragged or soft (polished out) edges will be rejected. Acid baths used for etching should be fresh and used in an environment and temperature that will provide the highest quality etched images. Infill with color as indicated by Design Intent Documents. Maintain ink fills true to the edges of letterforms/graphics. Etch to depth indicated in Design Intent Documents.

3.0 EXECUTION

3.1 GENERAL

A. Protection: Protect the work during the construction period so that it will be without any indication of use or damage. Leave the work clean and free from defects at time of acceptance.

B: Final Walk-Through and Punchlist: Final walk-through will be held with Project Architect and Owner to review the finished installation. A punchlist of all items requiring modification will be developed and issued. Project Architect and Owner reserve the right to reject all or part of a sign that does not correspond to the Design Intent Documents, specifications or the approved shop drawings. Sign Fabricator shall promptly conduct repair and completion of all items for final acceptance by the Owner.

C. Guarantee: Sign Fabricator to provide full guarantee of all workmanship, materials, equipment, etc. of this installation for a period of one (1) year after final acceptance. Sign Fabricator shall replace/repair any defective work within thirty (30) days after notification by Owner throughout the duration of this period.

D. Fabrication Errors: If the Sign Fabricator has made an error in copy (message), color, material, quality, etc. these items must be corrected within thirty (30) days of observation of error (at no additional cost). Sign Fabricator will be notified with a written punchlist as errors are discovered.

E. Erection of Signs: Set and attach the work accurately in location, alignment and elevation, plumb, level and true, as measured from established reference points and from other work already in place. Fit components accurately together to form tight joints and secure connections. Coordinate, through the Construction Manager, with other trades and make connections of illuminated signs to electrical service. Exterior wall penetrations and blocking are to be coordinated immediately upon award of contract. Test illuminated sign components and adjust operation for proper performance.

F. Illuminated Signs: Burn-in all illuminated signs for a period of 100 hours prior to delivery to the job site.

F. Adjusting: Neatly repair minor blemishes or marring on finished surfaces so that repairs are imperceptible. Completely replace components having permanent non-removable scratches, stains, or other defacement.

3.2 EXAMINATION

A. Verification of Conditions: Sign Fabricator must examine the areas to receive the work and the conditions under which the work will be performed. Prior to commencing work, verify that items, including anchor inserts, and electrical power provided are sized and located to accommodate work. Sign Fabricator shall remedy conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Pre-Installation Meeting: A pre-installation meeting will be held with Project Architect and Owner to mutually agree on all installation details, placement, etc.

3.3 INSTALLATION

A. General: Complete installation shall be in accordance with manufacturers' printed instructions and accepted shop drawings and best industry practice. Sign Fabricator will be responsible for daily clean up of their areas of work. Locate signs and accessories as indicated in Design Intent Document, using mounting methods of types described and in compliance with manufacturer's written instructions and best industry practice. Install signs level, plumb, and at heights indicated, with sign surfaces free from distortion and other defects in appearance.

B. Shim Plate Mounting: Provide concealed aluminum shim plates with predrilled and countersunk holes, at locations indicated, and where other mounting methods are not practicable. Attach plate with fasteners and anchors suitable for secure attachment to substrate. Attach signs to shim plate using mechanical fasteners or adhesives as indicated in Design Intent Documents. Where shim plate is exposed, provide a decorative cover as required.

C. Mechanical Fasteners: Use non-removable 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, engineer, or best industry practice.

D. Bracket-Mounted Units: Provide custom brackets, fittings, and hardware as appropriate for mounting signs that project at right angles from walls and ceilings. Attach brackets and fittings securely to walls and ceilings with concealed fasteners and anchoring devices to comply with manufacturer's written instructions, engineer, or best industry practice.

E. Dimensional Characters: Mount characters using standard fastening methods, type of mounting, wall construction, and condition of exposure indicated. Provide heavy paper template to establish character spacing and to locate holes for fasteners.

F. Cast-Metal Plaques: Mount plaques using standard fastening methods recommended in writing by manufacturer for type of wall surface indicated.

G. Illuminated Characters: Run wires into wall construction through conduit. Use insulators as necessary for neon lighting wiring. Exposed-to-view wiring or conduit on wall face is not permitted unless otherwise indicated.

3.4 CLEANING

A. Conform to Section 01 17 00 “Closeout Procedures”.

B. Upon completion of the work, remove unused materials, debris, containers and equipment from the project site. Remove protective coverings and clean the exposed surfaces of the Work to remove dirt, stains and other substances, by methods as recommended by manufacturer.

C. Removal of materials and devices that protect installed work at the time of substantial completion as agreed in advance with the Owner.

D. After installation, clean soiled sign surfaces. Protect signs from damage until acceptance by Owner.

E. Remove protective coating or materials from signs and from the job site when required.

F. Touch up all fasteners or finished surfaces scratched or blemished during installation.

SECTION 10 21 13 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Stainless-steel toilet compartments configured as toilet enclosures and urinal screens.

1.2 SUBMITTALS

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

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

C. Samples for each exposed product and for each color and texture specified.

D. Product certificates.

E. Maintenance data.

F. LEED Submittals:

   1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
   2. Product Certificates for Credit MR 4.1: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

      a. Include a statement indicating costs for each product having recycled content.

   3. Product Certificates for Credit MR 5.1: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

      a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" and ICC/ANSI A117.1 for toilet compartments designated as accessible.

PART 2 - PRODUCTS

2.1 STAINLESS-STEEL UNITS

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. Accurate Partitions Corporation.
2. All American Metal Corp.
3. American Sanitary Partition Corporation.
4. Ampco, Inc.
5. Bradley Corporation; Mills Partitions.
6. Flush Metal Partition Corp.
7. General Partitions Mfg. Corp.
8. Global Steel Products Corp.
9. Hadrian Manufacturing Inc.
10. Knickerbocker Partition Corporation.
11. Metpar Corp.
12. Rockville Partitions Incorporated.
13. Sanymetal; a Crane Plumbing company.
14. Shanahan's Limited.
15. Weis-Robart Partitions, Inc.

B. Toilet-Enclosure Style: Floor and ceiling anchored.

C. Urinal-Screen Style: Wall hung, wedge shaped.

D. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets pressure laminated to core material; with continuous, interlocking molding strip or lapped-and-formed edge closures; corners secured by welding or clips and exposed welds ground smooth. Exposed surfaces shall be free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch (25 mm) for doors and panels and 1-1/4 inches (32 mm) for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

E. Urinal-Screen Construction:
1. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum 6 inches (152 mm) wide at wall and minimum 1 inch (25 mm) wide at protruding end.

F. Facing Sheets and Closures: Stainless-steel sheet of nominal thicknesses standard with manufacturer:

G. Pilaster Shoes: Stainless-steel sheet, not less than 3 inches (76 mm) high, finished to match hardware.

H. Brackets (Fittings):
1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

I. Stainless-Steel Finish: Manufacturer's standard textured finish on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.
2. Hinges: Manufacturer's standard continuous, cam type that swings to a closed or partially open position.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.3 FABRICATION

A. Floor-and-Ceiling-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch- (610-mm-) wide, in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide, out-swinging doors with a minimum 32-inch- (813-mm-) wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

B. Clearances: Maximum 1/2 inch (13 mm) between pilasters and panels; 1 inch (25 mm) between panels and walls.

C. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than three brackets attached at midpoint and near top and bottom of panel. Locate wall brackets so holes for wall anchors occur in masonry or tile joints. Align brackets at pilasters with brackets at walls.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 10 21 13

SECTION 10 22 26 - OPERABLE PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manually operated, glass panel partitions.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design operable panel partitions including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Seismic Performance: Operable panel partitions shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

   1. The term "withstand" means "the panels will remain in place without separation of any parts from the assembly when subjected to the seismic forces specified."

1.3 SUBMITTALS

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

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

   1. Indicate storage and operating clearances. Indicate location and installation requirements for hardware and track, blocking, and direction of travel.

C. Samples: For each type of exposed material, finish, covering, or facing indicated.

D. Delegated-Design Submittal: For operable panel partitions indicated to comply with performance requirements, including analysis data and calculations signed and sealed by the qualified professional engineer responsible for their preparation.

   1. Design Calculations: Calculate requirements for seismic restraints.

E. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinated with each other, based on input from installers of the items involved:

F. Setting Drawings: For embedded items and cutouts required in other work, including support-beam, mounting-hole template.

G. Seismic Qualification Certificates: For operable panel partitions**,** accessories, and components, from manufacturer.

H. Product certificates.

I. Product test reports.

J. Field quality-control reports.

K. Operation and maintenance data.

L. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

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

B. Installer Qualifications: An employer of workers trained and approved by manufacturer.

C. Testing Agency Qualifications: Qualified according to Division 01 Section "Quality Requirements" for testing indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protectively package and sequence panels in order for installation. Clearly mark packages and panels with numbering system used on Shop Drawings. Do not use permanent markings on panels.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of operable panel partitions that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use, corrosion resistance, and finish indicated; manufacturer's standard strengths and thicknesses for type of use.

2.2 OPERABLE GLASS PANELS

A. Operable Glass Panels: Operable aluminum-framed glass panel partition system, including panels, suspension system, operators, and accessories.

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

a. Hufcor.
b. KWIK-WALL Company.
c. Modernfold, Inc.; a DORMA Group Company.
d. Nana Wall Systems, Inc.

B. Panel Operation: Manually operated, individual panels.

C. Panel Construction: Manufacturer's standard glazed panels, reinforced as required to support panel from suspension components and with reinforcement for hardware attachment. Fabricate panels with tight hairline joints and concealed fasteners. Fabricate panels so finished in-place partition is rigid; level; plumb; aligned, with tight joints and uniform appearance; and free of bow, warp, twist, deformation, and surface and finish irregularities.

D. Glass and Glazing: See Division 08 Section "Glazing."

1. Safety Glass: Provide glass products complying with testing requirements in 16 CFR 1201, for Category II materials, unless those of Category I are expressly indicated and permitted.
2. Glass: Manufacturer's standard glass and glass assemblies as indicated and complying with requirements in Division 08 Section "Glazing," and as follows:

a. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Type I (transparent flat glass), Class 1 (clear), Quality-Q3.
b. Glass Thickness: Manufacturer's standard thickness for indicated requirements.

3. Glazing System: Manufacturer's standard factory-glazing system.

E. Dimensions: Fabricate operable glass panel partitions to form an assembled system of dimensions indicated and verified by field measurements.

F. Panel Closure: Manufacturer's standard.

G. Hardware: Manufacturer's standard as required to operate operable panel partition and accessories; with decorative, protective finish.

H. Finishes:

1. Exposed Metal: As selected by Architect from manufacturer's full range as follows:

a. Aluminum: Baked powder coating.

2.3 SUSPENSION SYSTEMS

A. Suspension Tracks: Steel or aluminum mounted directly to overhead structural support, designed for type of operation, size, and weight of operable panel partition indicated. Size track to support partition operation and storage without damage to suspension system, operable panel partitions, or adjacent construction. Limit track deflection to no more than 0.10 inch (2.54 mm) between bracket supports. Provide a continuous system of track sections and accessories to accommodate configuration and layout indicated for partition operation and storage.

B. Carriers: Trolley system as required for configuration type, size, and weight of partition and for easy operation; with ball-bearing wheels.

C. Track Intersections, Switches, and Accessories: As required for type of operation, storage, track configuration, and layout indicated for operable panel partitions, and compatible with partition assembly specified. Fabricate track intersections and switches from steel or aluminum.

1. Multidirectional Switches: Adjustable switch configuring track into L, T, or X intersections and allowing panels to be moved in all pass-through, 90-degree change, and cross-over travel direction combinations.

D. Aluminum Finish: Mill finish or manufacturer's standard, factory-applied, decorative finish unless otherwise indicated.

E. Steel Finish: Manufacturer's standard, factory-applied, corrosion-resistant, protective coating unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with ASTM E 557 except as otherwise required by operable panel partition manufacturer's written installation instructions.

B. Install operable panel partitions and accessories after other finishing operations, including painting, have been completed.

C. Install panels from marked packages in numbered sequence indicated on Shop Drawings.

D. Broken, cracked, chipped, deformed, or unmatched panels are not acceptable.

E. Broken, cracked, deformed, or unmatched gasketing or gasketing with gaps at butted ends is not acceptable.

3.2 ADJUSTING

A. Adjust operable panel partitions to operate smoothly, without warping or binding. Lubricate hardware, electric operator, and other moving parts.

3.3 FIELD QUALITY CONTROL

A. Repair or replace operable panel partitions that do not comply with requirements.

B. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of repaired, replaced, or additional work with specified requirements.

C. Prepare test and inspection reports.

3.4 DEMONSTRATION

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

END OF SECTION 10 22 26

SECTION 10 26 00 - WALL AND DOOR PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes impact-resistant wall protection.

1.2 SUBMITTALS

A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for each impact-resistant wall-protection unit.

B. Shop Drawings: Submit shop drawings for each impact-resistant wall-protection unit showing locations and extent. Include sections, details, and attachments to other work.

C. Samples: Submit samples for each type of exposed finish required, prepared on Samples of size indicated below.

1. Impact-Resistant Wall Covering: 6 by 6 inches (150 by 150 mm) square.

D. LEED Submittals:

1. Completed "LEED Criteria Worksheet," for each component material of the product or assembly used in the installation of Work of this Section. Refer to Division 01 Section "Sustainable Design Requirements."
2. Product Certificates for Credit MR 4.1 and MR 4.2: For products having recycled content, documentation indicating percentages by weight of post-consumer and pre-consumer recycled content.

    a. Include a statement indicating costs for each product having recycled content.

3. Product Certificates for Credit MR 5.1 and MR 5.2: For products and materials required to comply with requirements for regional materials, certificates indicating location of material manufacturer and point of extraction, harvest, or recovery for each raw material.

    a. Include statement indicating distance to Project, cost for each regional material, and fraction by weight that is considered regional.

4. Certificates for Credit MR 6 and MR 7: Chain-of-custody certificates certifying that wood rails comply with forest certification requirements. Include evidence that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating costs for each certified wood product.
5. Product Data for Credit EQ 4.1: For adhesives, including printed statement of VOC content.
6. Product Data for Credit EQ 4.4: For medium density fiberboard and particleboard, documentation indicating that products contain no urea formaldehyde.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain impact-resistant wall-protection units through one source from a single manufacturer.

C. Fire-Test-Response Characteristics: Provide impact-resistant, plastic wall-protection units with surface-burning characteristics as determined by testing identical products per ASTM E 84, NFPA 255, or UL 723 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store impact-resistant wall-protection units in original undamaged packages and containers inside well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1. Maintain room temperature within storage area at not less than 70 deg F (21 deg C) during the period plastic materials are stored.
2. Keep plastic sheet material out of direct sunlight.
3. Store plastic wall-protection components for a minimum of 72 hours, or until plastic material attains a minimum room temperature of 70 deg F (21 deg C).

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install impact-resistant wall-protection units until building is enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining temperature at 70 deg F (21 deg C) for not less than 72 hours before beginning installation and for the remainder of the construction period.

B. Field Measurements: Verify actual locations of walls, and other construction contiguous with impact-resistant wall-protection units by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 IMPACT-RESISTANT WALL COVERINGS

A. Surface Mounted Plastic Wall Coverings (WP-01): Fabricated from rigid sheet vinyl wall covering material.

1. Basis-of-Design Product: Acrovyn, Construction Specialties, Inc.
2. Size: 48” wide x 8’-0” long sheets.
3. Sheet Thickness: 0.060 inch.

4. Color and Texture: Refer to Finish Materials Schedule drawing
5. Height: Refer to drawings
6. Trim and Joint Moldings: Extruded rigid plastic that matches sheet wall covering color.
7. Mounting: Adhesive using R-35 primer and Heavy Duty Clay Base Adhesive.

B. Fasteners: Provide stainless steel, screws for fastening surface mounted metal panels and corner guards to steel framing members.

2.2 FABRICATION

A. Fabricate impact-resistant wall-protection units to comply with requirements indicated for design, dimensions, and member sizes, including thicknesses of components.

B. Shear and punch metals cleanly and accurately. Remove burrs.

C. Ease exposed metal edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Provide for anchorage for metal wall protection items and for trim for plastic wall protection items of type indicated; coordinate with supporting structure.

1. Fabricate and space anchoring devices and fasteners a minimum of 16” o.c. along the four edges of each metal panel to secure wall covering rigidly in place.

2. Fabricate and space anchoring devices and fasteners a minimum of 24” o.c. along the edges of each corner guard leg to secure corner guard rigidly in place.

E. Drill holes in metal wall protection items to receive screws.

F. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Complete finishing operations, including painting, before installing impact-resistant wall-protection system components.

B. Before installation of plastic wall coverings, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION

A. General: Install impact-resistant wall-protection units level, plumb, and true to line without distortions. Do not use plastic wall covering materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.

B. Impact-Resistant Plastic Wall Covering: Provide top and edge moldings, corners, and divider bars as required for a complete installation.

C. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal wall protection items to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors. Provide screws threaded full length to the screw head.

3.4 CLEANING

A. Immediately after completion of installation, clean plastic items and accessories using a standard, ammonia-based, household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

SECTION 10 28 13 - TOILET ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes toilet and bath accessories.

1. Mirrored glass for frameless applications is specified in Section 08 83 00 MIRRORS

2. The extent of toilet and bath accessory work is indicated on the drawings and in the "Equipment Schedules".

1.2 SUBMITTALS

A. Product Data: Submit product data for each type of toilet and bath accessory product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.

B. Product Schedule: Submit product schedule indicating types, quantities, sizes, and installation locations by room of each accessory required.

C. Maintenance Data: Submit maintenance data for toilet and bath accessories to include in maintenance manuals.

1.3 QUALITY ASSURANCE

A. Source Limitations: Provide products of the same manufacturer for each type of accessory unit and for units exposed to view in the same areas, unless otherwise acceptable to the Architect.

1.4 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.0312-inch (0.8-mm) minimum nominal thickness, with polished No. 4 finish, unless otherwise indicated.

B. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

C. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

D. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

2.2 ACCESSORIES

A. Recessed Paper Towel Dispenser and Waste Receptacle (T1): Provide recessed paper towel dispenser and waster receptacle fabricated from type 304 stainless steel with all welded construction; exposed surfaces shall be satin finished. Flange shall be drawn and beveled, one-piece, seamless construction. Door shall be 18 ga. (1.2 mm); be secured to cabinet with a concealed, full length, stainless steel piano hinge and equipped with a concealed tumbler lock keyed to the other toilet accessories in the same toilet room. Paper towel dispenser shall be capable of dispensing 600 C-fold or 800 multifold paper towels. Waste receptacle shall be secured to cabinet with a tumbler lock, have front and side edges of bottom and all top edges hemmed for safe handling, and with a minimum capacity of 12 gal.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-3947.
b. Bradley; Model 234.
c. ASI; 64696A

B. Recessed Sanitary Napkin Disposal (T2A): Fabricate sanitary napkin disposals from type 304 stainless steel with all welded construction; exposed surfaces to have satin finish. Doors shall have 9/16” (14 mm) 90 degree returns and be equipped with a concealed, full length stainless steel piano hinge. Napkin disposal shall have self closing stainless steel panel covering receptacle opening. Panel shall be equipped with full-length stainless steel piano hinge and international graphic symbol identifying napkin diposal. Unit shall be furnished with a removable, leakproof, molded polyethylene receptacle. Receptacle shall have a capacity of 1.2 gal.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-35303.
b. Bradley; Model 4731
c. ASI; 0473.

C. Partition Mounted Sanitary Napkin Disposal (T2B): Fabricate sanitary napkin disposals from type 304 stainless steel with all welded construction; exposed surfaces to have satin finish. Doors shall have 9/16" (14 mm) 90 degree returns and be equipped with a concealed, full length stainless steel piano hinge. Napkin disposal shall have self closing stainless steel panel covering receptacle opening. Panel shall be equipped with full-length stainless steel piano hinge and international graphic symbol identifying napkin diposal. Unit shall be furnished with a removable, leakproof, molded polyethylene receptacle. Receptacle shall have a capacity of 1.2 gal.

1. Product and Manufacturer:

    a. Bobrick; B-354

D. Surface Mounted Stainless Steel Twin Jumbo-Roll Toilet Tissue Dispenser (T3): Surface mounted, jumbo roll, toilet tissue dispenser door, cabinet and mounting plate shall be constructed of type 304 stainless steel. Door shall be 18 ga. (1.2 mm) with a wide viewing slot to reveal toilet tissue supply. Cabinet shall be 20 ga. (1 mm), and be equipped with a tumbler lock. Unit shall be fastened through 20 ga. (1 mm) stainless steel mounting plate. Dispensing mechanism shall be constructed of high impact, chemical resistant, flame retardant rigid vinyl; shall accommodate two 9" or 10" diameter toilet tissue rolls; and be equipped with a sliding access panel that exposes one roll at a time. Spindles shall be convertible in the field to dispense 3" or 2-1/4" diameter core rolls with use of removable core adapters furnished.

1. Product and Manufacturer: One of the following:

    a. Bobrick; B-2892.

    b. Bradley; Model 5425.
    c. ASI; 0040.

E. Recessed Toilet Seat Cover Dispenser (T4): Provide recessed toilet seat cover dispensers fabricated from type 304 stainless steel with all welded construction; exposed surfaces shall be satin finished. Flange shall be drawn and beveled, one-piece, seamless construction. Door shall be secured to cabinet with a full length, stainless steel piano hinge and equipped with a tumbler lock keyed like the other accessories in the toilet room wherein the dispenser is installed. Dispenser shall have a capacity of 500 paper toilet seat covers.

1. Product and Manufacturer: One of the following:

    a. Bobrick; B-3013.
    b. Bradley; Model 584.
    c. ASI; 0477.

F. Recessed Napkin/Tampon Vendors: Frameless, recessed sanitary napkin/tampon vendor shall be provided for coin operation as specified below, in one cabinet to provide sanitary napkins or tampons at users option. The unit shall be fabricated from type 304 stainless steel with all welded construction. Exposed surfaces shall have a satin polished finish. Door shall be 18 ga. have 7/8" 90 degree return edges and provided with two tumbler locks; be secured to a 22 ga. cabinet with a concealed, full length stainless steel piano hinge. Pull knobs shall be operable

with one hand and with less than 5 lbs. of force to comply with ADA barrier free accessibility guidelines. Capacity: Minimum 15 sanitary napkins and minimum 22 tampons.

1. (T5): Provide each unit for installed $0.25 single-coin operation. Each coin box shall be equipped with a tumbler lock that is keyed differently than door locks.

    a. Product and Manufacturer: One of the following:

        1) Bobrick; B-3500 25.
        2) Bradley; Model 407-45.
        3) ASI; 04684 set for $0.25 operation.

G. Grab Bars (T6): Provide grab bars in the configurations shown on the drawings and as follows.

1. Mounting: Snap on escutcheons to conceal flange mounting fasteners.

2. Material: Stainless steel, 0.05 inch (1.3 mm) thick.

    a. Finish: Smooth, No. 4, satin finish.

3. Clearance: 1-1/2" clearance between wall surface and inside face of bar.

4. Outside Diameter: 1-1/2 inches (38 mm).

5. Surface Textures:

    a. G1 and G2: Satin finish.

    b. G3: Satin finish with peened gripping surface.

6. Products and Manufacturers: One of the following:

    a. Bobrick; B-6806.
    b. Bradley; Model 812-2.
    c. ASI; 3800 Series.

H. Surface Mounted Stainless Steel Baby Changing Station (T10B): Provide baby changing stations with body manufactured from high –impact polyethylene. Each unit shall be equipped with a pneumatic cylinder for controlled opening and closing of bed. Bed shall be secured to back plate with a concealed, full length steel hinge. No hinge structure shall be exposed on exterior or interior surfaces. Each unit shall have steel mounting plates with mounting hardware included. Each unit shall conform to ANSI S117.1, load support, pinch points, and child restraint. The tested and rated static load shall be not less than 300 pounds. Each unit shall be installed to be ADA compliant. The bed of each unit shall have smooth concave changing area with nylon safety strap. Each unit to have a built in liner dispenser for use with 3 ply chemical free biodegradable sanitary liners, universal instruction graphics and safety messages in multiple languages.

1. Product and Manufacturer: One of the following:

    a. Koala Kare Products Div. Of Bobrick; KB110-SSWM.

b. Bradley; Model 9611.
c. ASI; 9011.

I. Recessed Stainless Steel Baby Changing Station (T10A): Provide baby changing stations with body manufactured from high –impact polyethylene. Each unit shall be equipped with a pneumatic cylinder for controlled opening and closing of bed. Bed shall be secured to back plate with a concealed, full length steel hinge. No hinge structure shall be exposed on exterior or interior surfaces. Each unit shall have steel mounting plates with mounting hardware included. Each unit shall conform to ANSI S117.1, load support, pinch points, and child restraint. The tested and rated static load shall be not less than 300 pounds. Each unit shall be installed to be ADA compliant. The bed of each unit shall have smooth concave changing area with nylon safety strap. Each unit to have a built in liner dispenser for use with 3 ply chemical free biodegradable sanitary liners, universal instruction graphics and safety messages in multiple languages.

1. Product and Manufacturer:

a. Koala Kare Products Div. Of Bobrick; KB110-SSRE

J. Lavatory Mounted Soap Dispenser (T7A): Lavatory mounted soap dispenser shall dispense liquid and lotion soaps, and synthetic detergents. Valve shall be operable with one hand and with less than 5 pounds of force to comply with ADA. Piston and spout assembly shall be type 304 stainless steel with bright polished finish. 6” Spout shall rotate 360 degrees without damage to valve mechanism. Escutcheon shall lock to body with concealed locking mechanism that is opened with special key. Piston, spout, and supply tube assembly shall be removable from top for filling and maintenance. Valve shall be equipped with plastic cylinder, stainless steel spring, U packing seal, and duckbills. Shank shall accommodate lavatory top thickness indicated. Plastic container shall have a minimum capacity of 20 fluid ounces.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-8226.
b. Bradley; Model 6326-68.
c. ASI; 0332-CD.

K. Soap Dispensing System (T7B): Under lavatory mounted bulk soap dispensing system shall dispense liquid and lotion soaps, and synthetic detergents. Soap cabinet: 18-8 S type 304, 20 ga stainless steel, all welded construction with side hole for low soap indicator light. Exposed cabinet surfaces to have #2B finish. Soap cabinet door 18-8 S type 304, 22 ga stainless steel, exposed door surfaces to have # satin finish. Door secured to cabinet with full length piano hinge. Soap reservoir capacity 0.5 gal. Free turning swivel assembly and soad supply tubing to be high strength anti-bacterial soap resistant plastic

1. Product and Manufacturer:

a. Bobrick; Sureflo B-830
b. Bradley; Model 6326-68.
c. ASI; 0332-CD.

L. Tilt Mirror with Stainless Steel Frame (T11): The mirror frame shall be manufactured from type 304 stainless steel with beveled front to hold frame tightly against mirror; corners shall be welded, ground, and polished smooth; all exposed surfaces shall have satin finish with vertical grain. Float glass mirror shall be guaranteed for 15 years against silver spoilage. Back shall be protected by full-size shock absorbing, water resistant, non-abrasive, foam or polystyrene padding. Back and inner stiffener frame shall be galvanized steel, one-piece welded construction with slots for mounting screws and integral screw head lock.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-293 2436.
b. Bradley; Model 7405- 24” w.- 36” -h. furnish less shelf.
c. ASI; 0535 24” x 36”.

M. Heavy Duty Shower Curtain Rod (XX): Shower curtain shall be fabricated from type 304 minimum 20 ga. (1.0 mm) thick stainless steel tubing with satin finish and 1” (25 mm) outside diameter. Flanges shall be type 304 20 ga. (1.0 mm) stainless steel with satin finish and drawn, one piece, seamless construction; provide in lengths as required to span openings indicated.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-6107.
b. Bradley; Model 9538.
c. ASI; 1224.

N. Stainless Steel Shelf (T8B): Shelf shall be fabricated from type 304, 18 ga. stainless steel with satin finish. Mounting brackets, welded to shelf, shall be 16 ga. stainless steel. Shelf shall be 16 inches long by 5” wide with ¾” return edges. Front edges shall be hemmed for safe handling.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-295 x 16.
b. Bradley; Model 755 x 16” .
c. ASI; 0692 x 16”.

O. Folding Utility Shelf (T8A): Utility shelf shall be fabricated from either chrome plated die cast zinc or type 304 stainless steel with all welded construction; exposed surfaces shall have a satin finish. Shelf shall be equipped with a heavy duty internal spring. Shelf shall automatically return to upright position when not in use.

1. Product and Manufacturer: One of the following:

a. Bobrick; B-287 .
b. Bradley; Model 790.
c. ASI; 0698.

P. Surface Mounted Robe Hook (T9A): A surface mounted robe hook fabricated from type 304 stainless steel; satin finished. Flange and support arm shall be minimum 22 gauge (0.8 mm) and

equipped with a concealed, 18 ga. (1.2 mm) mounting bracket that is secured to a concealed, wall plate with a stainless steel set screw. Cap shall be approximately 14 ga. (2.0 mm), welded to the support arm.

1. Product and Manufacturer: One of the following:

    a. Bobrick; B-76717.
    b. Bradley; Model 9114.
    c. ASI; 7340.

Q. Surface Mounted Robe Hook with Concealed Mounting (T9B): A heavy duty robe hook with concealed mounting fabricated from one piece brass casting with nickel-plated finish. Hook shall be secured to a concealed wall plate with stainless steel setscrews. Hook shall withstand 300 lb. downward pull when installed.

1. Product and Manufacturer: One of the following:

    a. Bobrick; B-2116.
    b. Bradley; Model 9119.
    c. ASI; 0751.

R. Air Hand Dryers (E13): Die cast aluminum casing, digital motor, HEPA filter and reflective infrared sensor. See equipment schedule and electrical drawings for additional information.

1. Product and Manufacturer:
    a. Dyson Airblade AB02

2.3 FABRICATION

A. General: Only a maximum 1-1/2" diameter, unobtrusive stamped manufacturer logo, as approved by Architect, is permitted on exposed face of toilet accessory units. On either interior surface not exposed to view or back surface, provide additional identification by either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all-welded construction, without mitered corners. Hang doors or access panels with full-length, stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf (1112 N), when tested according to method in ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102813

SECTION 10 44 00 - FIRE-PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fire protection specialties.

1.2 SUBMITTALS

A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire-protection specialties.

1. Fire Extinguishers: Include rating and classification.
2. Fire-Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
3. Show location of knockouts for hose valves.

B. Maintenance Data: Submit maintenance data for fire extinguishers.

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain fire extinguishers and fire-protection cabinets through one source from a single manufacturer.

B. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved by FMG.

D. Recessed Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements of ASTM E 814 for fire-resistance rating of walls where they are installed.

E. Hose and valve cabinets shall comply with International Building Code and NFPA.

1.4 COORDINATION

A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate size of fire-protection cabinets to ensure that type and capacity of hose valves indicated are accommodated.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of portable fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FIRE EXTINGUISHERS

A. General: Provide fire extinguishers for each fire protection cabinet and other locations indicated, in manufacturers standard factory finish, that comply with authorities having jurisdiction.

B. Multipurpose Dry-Chemical Type: UL-rated 20A-120B:C, 20 lb. nominal capacity, in enameled-steel container.

2.2 FIRE PROTECTION CABINETS

A. General: Provide fire protection cabinets of suitable size for housing fire extinguishers, and where indicated, sized to house a fire extinguisher, hose, rack and valve, of types and capacities specified.

B. Fire-Rated Cabinets: Furnished fire rated cabinets for cabinets recessed into fire rated partition construction. Cabinet rating shall meet or exceed the fire rating of the partition in which it is to be installed.

C. Construction:

1. Cabinet Types:

a. Fire Extinguisher Cabinets: Provide manufacturer's standard enameled steel box, with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

b. Fire Extinguisher and Valve Cabinets: Provide manufacturer's standard enameled steel box, with trim, frame, shelving, door, and hardware to suit cabinet type, trim style, and door style indicated. Weld joints and grind smooth. Miter and weld perimeter door frames.

2. Cabinet Mounting: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

3. Trim Style: Trimless with hidden flange of same metal and finish as box (tub) that overlaps surrounding wall finish and is concealed from view by an overlapping door.

4. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

   a. Typical Door Material and Construction: Manufacturer's standard flush, hollow steel door construction with tubular stiles and rails, enameled steel finished.

   b. Stainless Steel Door Material and Construction: Manufacturer's standard flush, hollow stainless steel door construction with tubular stiles and rails, NAAMM No. 4 satin finished.

      1) Stainless steel cabinet doors are required where fire protection cabinets are indicated to be built into stainless steel clad wall panels.

   c. Door Glazing:

      1) Fire Extinguisher Cabinet Doors: Clear float glass complying with ASTM C1036, Type I, Class 1, Quality q3.

      2) Fire Extinguisher, and Valve Cabinets: ASTM C 1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.

5. Door Style:

   a. Fire Extinguisher Cabinet Doors: Manufacturer's standard design, Duo-Panel with 1/4" thick glass.

   b. Fire Extinguisher, Hose Valve Cabinets: Manufacturer's standard design, full glass with 6 mm thick wire glass.

6. Door Hardware: Provide manufacturer's standard door operating hardware of proper type for cabinet type, trim style, and door material and style specified. Provide exposed door pull and friction latch. Provide concealed continuous type hinge permitting door to open 180 deg.

D. Products and Manufacturers:

1. Fire Extinguisher Cabinets: One of the following:

   a. Larsens Manufacturing Company:

      1) Typical Cabinets: Occult Series Fire Extinguisher Cabinets, Model O-3216 with vertical duo door. Provide Model FS O-3216 with vertical duo door at fire rated partitions.

      2) Stainless Steel Cabinets: Occult Series Fire Extinguisher Cabinets, Provide Model O-3216-SS with vertical duo door. Provide Model FS O-3216-SS with vertical duo door at fire rated partitions.

   b. Potter Roemer:

1) Typical Cabinets: Dana Series Fire Extinguisher Cabinets, 7225-DV. Provide Model FRC-7225 DV with vertical duo door at fire rated partitions.
2) Stainless Steel Cabinets: Dana Series Fire Extinguisher Cabinets, 7265-DV-Stainless Steel. Provide Model FRC 7265 DV – Stainless Steel with vertical duo door at fire rated partitions.

c. JL Industries, Inc.:

1) Typical Cabinets: Embassy Series Fire Extinguisher Cabinets, Model 5614-Contemporary V door. Provide Model Fire-FX - 5714-Contemporary V door at fire rated partitions.

2) Stainless Steel Cabinets: Embassy Series Fire Extinguisher Cabinets, Model 5634-Contemporary V door. Provide Model Fire-FX - 5734-Contemporary V door at fire rated partitions.

2. Fire Hose Valve Cabinets: One of the following:

a. Larsens Manufacturing Company:

1) Typical Cabinets: HCS3242 Series Fire Hose Cabinets, fully recessed box with trimless frame full glass door.

2) Stainless Steel Cabinets: HCSS3242 Series Fire Hose Cabinets, fully recessed box with trimless frame full glass door.

b. Potter Roemer:

1) Typical Cabinets: 1100 Series Fire Hose Cabinets – fully recessed box with trimless frame, custom fabricated for 125 foot hose length.

2) Stainless Steel Cabinets: 1100 Series Fire Hose Cabinets – fully recessed box with trimless frame and Stainless Steel door, custom fabricated for 125 foot hose length.

2.3 AUTOMATED EXTERNAL DEFIBRILLATORS AND CABINETS

A. General: Automated external defibrillators and cabinets shall be provided where indicated on the drawings.

1. Product and Manufacturer: LifeStartTM 1436S21 cabinets with #4 brushed stainless steel tubs for fully recessed application and #4 brushed stainless steel flat trim and full acrylic door; J.L. Industries, Inc.

2. Defibrillators: Sized to fit specified cabinets; Forerunner II Defibrillator; Phillips Electronics.

2.4 FINISHES FOR FIRE PROTECTION CABINETS

A. General: Comply with NAAMM "Metal Finishes Manual" for finish application recommendations except as otherwise indicated. Apply finishes in factory after products are assembled. Protect cabinets with plastic or paper covering, prior to shipment.

B. Painted Finishes: Provide painted finish to comply with requirements indicated below for extent, preparation and type:

1. Extent of Painted Finish: Apply painted finish to both concealed and exposed surfaces of cabinet components.

2. Color: Provide color or color matches indicated, or, if not otherwise indicated, as selected by Architect from manufacturer's standard colors.

3. Preparation: Clean surfaces of dirt, grease, and loose rust or mill scale.

4. Field-Paintable Factory Finish: Immediately after cleaning and pretreatment, apply to surfaces indicated below, manufacturer's standard factory-applied paint system which is suitable, after deglossing, as an undercoat for field-applied paint system specified in Section 09 91 00 PAINTING:

a. Exterior of cabinet except for those surfaces indicated to receive stainless steel finish.

b. Interior of cabinet.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare recesses for recessed fire-protection cabinets as required by type and size of cabinet and trim style.

3.2 INSTALLATION

A. General: Follow manufacturer's printed instructions for installation.

B. Install fire-protection specialties in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction . Fasten fire-protection cabinets to structure, square and plumb.

3.3 ADJUSTING AND CLEANING

A. Adjust fire-protection cabinet doors to operate easily without binding. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged units.

B. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

END OF SECTION 10 44 00

SECTION 11 13 00 - LOADING DOCK EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes loading dock equipment.

1.2 DEFINITIONS

A. Operating Range: Maximum amount of travel above and below the loading dock level.

B. Working Range: Recommended amount of travel above and below the loading dock level for which loading and unloading operations can take place.

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, rated capacities, operating characteristics, furnished specialties, accessories, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Product Test Reports: Based on evaluation of tests performed by manufacturer and supervised and verified by a qualified independent professional engineer, indicate compliance of dock levelers with requirements of MH 30.1 for determining rated capacity, which is based on comprehensive testing within the last two years of current products.

1. Submittal Form: According to MH 30.1, Appendix A.

D. Maintenance Data: For loading dock equipment to include in maintenance manuals.

E. Warranties: Special warranties specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

1. Maintenance Proximity: Not more than two hours' normal travel time from Installer's place of business to Project site.

B. Source Limitations: Obtain each type of loading dock equipment through one source from a single manufacturer.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed pit dimensions slopes of driveways and heights of loading docks and proceed with fabricating loading dock equipment without field measurements. Coordinate loading dock construction to ensure that actual dimensions correspond to established dimensions.

1.6 COORDINATION

A. Coordinate installation of anchorages for loading dock equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

B. Recessed Loading Dock Equipment: Coordinate size and location of pits to ensure proper clearances and operation of equipment.

1. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."

C. Electrical Requirements: Coordinate wiring requirements and current characteristics of loading dock equipment with building electrical system. See Division 16 Sections.

1.7 WARRANTY

A. Special Warranty for Dock Levelers: Manufacturer's standard form in which manufacturer agrees to repair or replace dock-leveler components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracked or broken structural support members and load-bearing welds.
b. Deck plate failures including cracked plate or permanent deformation in excess of 1/4 inch (6 mm) between deck supports.
c. Hydraulic system failures including failure of hydraulic seals and cylinders.
d. Faulty operation of operators, control system, or hardware.

2. Warranty Period for Structural Assembly: 10 years from date of Substantial Completion.

3. Warranty Period for Hydraulic System: Five years from date of Substantial Completion.
4. Warranty shall be for unlimited usage of the leveler for the specified rated capacity over the term of the warranty.

1.8 MAINTENANCE SERVICE

A. Initial Maintenance Service: Beginning at Substantial Completion, provide 12 months' full maintenance by skilled employees of loading dock equipment Installer. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper equipment operation at rated speed and capacity. Provide parts and supplies same as those used in the manufacture and installation of original equipment.

1. Perform maintenance, including emergency callback service, during normal working hours.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from steel plate complying with ASTM A 572/A 572M, Grade 55 (380).

C. Steel Tubing: ASTM A 500, cold formed.

D. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

2.2 DOCK BUMPERS

A. Laminated-Tread Bumpers: Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- (19-mm-) diameter, steel supporting rods that are welded at one end to 1/4-inch- (6-mm-) thick, structural-steel end angle and secured with a nut and angle at the other end. Fabricate angles with predrilled anchor holes and sized to provide not less than 1 inch (25 mm) of tread plies extending beyond the face of closure angles.

B. Anchorage Devices: Hot-dip galvanized steel anchor bolts, nuts, washers, bolts, sleeves, cast-in-place plates, and other anchorage devices as required to fasten bumpers securely in place and to suit installation type indicated.

2.3 RECESSED DOCK LEVELERS (Equipment Item E26)

A. General: Recessed, hinged-lip-type dock levelers designed for permanent installation in concrete pits preformed in the edge of loading platform; of type, function, operation, capacity,

size, and construction indicated; and complete with controls, starter/disconnect switches, safety devices, indicator lights, and accessories required.

1. Basis-of-Design Product: RiteHite Genisys Hydraulic Dock Leveler Series.

B. Quality Standard: MH 30.1, "Safety, Performance and Testing of Dock Leveling Devices."

C. Rated Capacity: Capable of supporting total gross load of 30,000 pounds unless otherwise indicated without permanent deflection or distortion, as determined by actual tests according to MH 30.1.

D. Function: Dock levelers shall compensate for differences in height between truck bed and loading platform in the following manner:

1. Vertical Travel: Provide operating range above platform level of sufficient height to enable lip to extend and clear truck bed before contact.
2. Automatic Vertical Compensation: Floating travel of ramp with lip extended and resting on truck bed shall compensate automatically for upward or downward movement of truck bed during loading and unloading.
3. Automatic Lateral Compensation: Tilting of ramp with lip extended and resting on truck bed shall compensate automatically for canted truck beds of up to 4 inches (100 mm) over width of ramp.
4. Lip Operation: Manufacturer's standard mechanism that automatically extends and supports hinged lip on ramp edge with lip resting on truck bed over dock leveler's working range, allows lip to yield under impact of incoming truck, and automatically retracts lip when truck departs.
5. Automatic Ramp Return: Automatic return of unloaded ramp, from raised or lowered positions to stored position, level with platform, as truck departs.

E. Hydraulic Operating System: Electric-powered hydraulic raising and hydraulic lowering of ramp, controlled from a remotely located push-button station. Equip leveler with a packaged unit including a unitized, totally enclosed, nonventilated electric motor, pump, manifold reservoir, and valve assembly of proper size, type, and operation for capacity of leveler indicated. Include means for lowering ramp below platform level with lip retracted behind dock bumpers. Provide a hydraulic velocity fuse connected to main hydraulic cylinder to limit loaded ramp's free fall to not more than 3 inches (76 mm.)

1. Remote-Control Station with Emergency Stop: Multibutton control station with an UP button of the constant-pressure type and an emergency STOP button of the momentary-contact type, enclosed in NEMA ICS 6, Type 12 box. Ramp raises by depressing and holding UP button; ramp lowers at a controlled rate by releasing UP button. All ramp movement stops, regardless of position of ramp or lip, by depressing STOP button. Normal operation resumes by engaging a manual reset button or by pulling out STOP button.

    a. Master Panel: Control panel with integral fused disconnecting means for operating dock leveler, and dock door.

F. Construction: Fabricate dock-leveler frame, platform supports, and lip supports from structural- or formed-steel shapes. Weld platform and hinged lip to supports. Fabricate entire assembly to

withstand deformation during both operating and stored phases of service. Chamfer lip edge to minimize obstructing wheels of material-handling vehicles.

1. Hinged Lip: Full width, piano-type hinge with heavy-wall hinge tube and greased fittings, with gussets on lip and ramp for support.
2. Toe Guards: Equip open sides of rising ramp over range indicated with metal toe guards mounted flush with ramp edges and projecting below ramp.

    a. Finish: Factory finish dock levelers after assembly and testing. Paint toe guards yellow to comply with ANSI Z535.1.

3. Cross-Traffic Support: Manufacturer's standard method of supporting ramp at platform level in stored position with lip retracted. Provide a means to release supports to allow ramp to descend below platform level.
4. Maintenance Strut: Integral strut to positively support ramp in up position during maintenance of dock leveler.
5. Integral Dock Bumpers: Fabricated from 4-inch- (100-mm-) thick, tire fabric heavy molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Type A Shore durometer hardness of 80, plus or minus 5, when tested according to ASTM D 2240. Provide two dock bumpers for each recessed dock leveler, attached to face of loading dock with expansion bolts.

G. Accessories:

1. Curb Angles: 3-by-3-by-1/4-inch (76-by-76-by-6-mm) galvanized steel curb angles for edge of recessed leveler pit, with 1/2-inch- (13-mm-) diameter by 6-inch- (152-mm-) long concrete anchors welded to angle at 6 inches (152 mm) o.c.
2. Night Locks: Manufacturer's standard means to prevent extending lip and lowering ramp when overhead doors are locked.
3. Side and rear weatherseals.
4. Abrasive skid-resistant surface.
5. LED Dock light (1Each) Model LEDDL, 60” arm, 10 foot long standard male plug, by Loading Dock Supply, LLC or equal.

2.4 SCISSOR LIFT (Equipment Item E25)

A. General: Recessed, scissor lift designed for permanent installation in concrete pits preformed in the EDS room; of type, function, operation, capacity, size, and construction indicated; and complete with controls, starter/disconnect switches, safety devices, indicator lights, and accessories required.

1. Basis-of-Design Product: “Sizzrdok” with no bridge manufactured by ECOA Industrial Products, Inc. of Hialeah, Florida or approved equal.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish loading dock equipment after assembly and testing.

C. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M for iron and steel loading dock equipment.
2. ASTM A 153/A 153M for iron and steel hardware for loading dock equipment.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of loading dock equipment.

B. Examine roughing-in for electrical systems for loading dock equipment to verify actual locations of connections before equipment installation.

C. Examine walls and floors of pits for suitable conditions where recessed loading dock equipment is to be installed. Pits shall be plumb and square and properly sloped for drainage from back to front of loading dock.

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

3.2 PREPARATION

A. Coordinate size and location of loading dock equipment indicated to be attached to or recessed into concrete or masonry, and furnish anchoring devices with templates, diagrams, and instructions for their installation.

B. Set curb angles in concrete edges of dock-leveler recessed pits with tops flush with loading platform. Fit exposed connections together to form hairline joints.

C. Set curb angles in concrete edges of truck-leveler recessed pits with tops flush with driveway. Fit exposed connections together to form hairline joints.

D. Clean recessed pits of debris.

3.3 INSTALLATION

A. General: Install loading dock equipment, including motors pumps control stations wiring safety devices and accessories as required for a complete installation.

1. Rough-in electrical connections according to requirements specified in Division 16.

B. Dock Bumpers: Attach dock bumpers to face of loading dock in a manner that complies with requirements indicated for spacing, arrangement, and position relative to top of platform and anchorage.

1. Welded Attachment: Plug-weld anchor holes in contact with steel inserts and fillet weld at other locations.
2. Bolted Attachment: Attach dock bumpers to preset anchor bolts embedded in concrete or to cast-in-place inserts or threaded studs welded to embedded-steel plates or angles. If preset anchor bolts, cast-in-place inserts, or threaded studs welded to embedded-steel plates or angles are not provided, attach dock bumpers by drilling and anchoring with expansion anchors and bolts.
3. Screw Attachment: Attach dock bumpers to wood construction with lag bolts as indicated.

C. Recessed Dock Levelers: Attach dock levelers securely to loading dock platform, flush with adjacent loading dock surfaces and square to recessed pit.

3.4 ADJUSTING AND CLEANING

A. Adjust loading dock equipment for proper, safe, efficient operation.

B. Test dock levelers for vertical travel within operating range indicated.

C. Restore marred, abraded surfaces to their original condition.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain loading dock equipment. Refer to Division 1 Section "Closeout Procedures."

3.6 LOADING DOCK EQUIPMENT SCHEDULE

A. Laminated-Tread Dock Bumper:

1. Thickness: 4-1/2 inches (114 mm).
2. Horizontal Style: 12 inches (305 mm) high by length indicated on Drawings.

B. Recessed Dock Leveler:

1. Operation: Hydraulic operating system with weatherproof, multibutton remote-control station.

2. Platform Size: As indicated on Drawings.
3. Operating Range: 12” above and 12” below dock level.
4. Length of Lip Extension: 20 inches (508 mm).
5. Platform: Nonskid steel plate.
6. Hinged Lip: Nonskid steel plate.
7. Frame: Manufacturer's standard type.
8. Toe-Guard Range: Entire upper operating range.
9. Accessories:

    a. Night locks.
    b. Side and rear weatherseals.

10. Finish: Hot-dip galvanized.

11. Power Characteristics: 480V, 3 phase.

END OF SECTION 111300

SECTION 12 48 16 - ENTRANCE FLOOR GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes floor mats, frames and grilles.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide foot grilles and frames capable of withstanding the following loads and stresses:

1. Wheel loads: 500 lb per wheel.

1.3 SUBMITTALS

A. Product Data: Submit product data including construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Submit shop drawings showing the following:

1. Items penetrating foot grilles and frames, including the following:

a. Door control devices.

b. Revolving door control devices and show cases.

2. Divisions between mat and grille fields.

3. Perimeter floor moldings.

C. Samples: Submit samples for each type of product indicated.

1. Floor Mat: 12-inch- (300-mm-) square, assembled sections floor mat.

2. Foot Grille: 12-inch- (300-mm-) square assembled sections.

3. Frame Members: 12-inch- (300-mm-) long Sample of each type and color.

D. Maintenance Data: Submit maintenance data for floor mats and grilles.

1.4 QUALITY ASSURANCE

A. Accessibility Requirements: Provide installed foot grilles that comply with Section 4.5 in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1.5 PROJECT CONDITIONS

A. Field Measurements: Indicate measurements on Shop Drawings.

1.6 COORDINATION

A. Coordinate size and location of recesses in concrete with installation of finish floors to receive floor grilles and frames.

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. Carpet Inserts: Full-size units equal to 8 percent of amount installed for each size, color, and pattern indicated, but no fewer than 40 units.

PART 2 - PRODUCTS

2.1 FLOOR FRAMES AND GRILLES (WM-01)

A. General: Provide manufacturer's standard foot-grille assemblies consisting of treads of type and profile indicated, interlocked or joined together by cross members, and with support legs (if any) and other components needed to produce a complete installation.

B. Stainless-Steel Foot Grilles (WM-01): Type 304, with all joints electric resistance welded.

1. Surface Treads: As indicated by product specified.
2. Stainless-Steel Finish: No. 4 finish.
3. Grille Size: As indicated.
4. Basis of Design Manufacturer and Products:

a. WM-01: C/S Group, 1-3/16” deep GridLine-LBDP, with recessed pan and drain.

C. Lockdown: In view.

2.2 FRAMES

A. Provide manufacturer's standard frames of size and style for grille type, for permanent recessed installation in subfloor, complete with installation anchorages and accessories. Unless otherwise indicated, fabricate frame of same material and finish as grilles.

2.3 SUPPORT SYSTEM

A. Level Bed Applications for aluminum grilles: Provide manufacturer's standard, vinyl cushion support system.

B. Drainage Pit Applications: Provide manufacturer's special deep-pit frame and support extrusion system with intermediate support beams, sized and spaced as recommended by manufacturer for indicated spans and equipped with vinyl support cushions.

2.4 DRAIN PANS

A. Provide manufacturer's standard, stainless-steel sheet drain pan with NPS 2 (DN 50) drain outlet for each floor grille unit. Coat bottom of pan with protective coating recommended by manufacturer.

2.5 FABRICATION

A. Shop fabricate foot grilles to greatest extent possible in sizes as indicated. Unless otherwise indicated, provide each grille as a single unit; do not exceed manufacturer's recommended maximum sizes for units that are removed for maintenance and cleaning. Where joints in grilles are necessary, space symmetrically and away from normal traffic lanes.

B. Fabricate frame members in single lengths or, where frame dimensions exceed maximum available lengths, provide minimum number of pieces possible, with hairline joints equally spaced and pieces spliced together by straight connecting pins.

2.6 CONCRETE FILL AND GROUT MATERIALS

A. Provide concrete grout and fill equivalent in strength to cast-in-place concrete slabs for recessed grilles and frames. Use aggregate no larger than one-third fill thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and floor conditions for compliance with requirements for location, sizes, minimum recess depth, and other conditions affecting installation of floor mats, grilles and frames.

B. Examine roughing-in for drainage piping systems to verify actual locations of piping connections before foot grille and frame and drain pan installation.

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

3.2 INSTALLATION

A. Frame and Grille Installation (WM-01): Install recessed foot grilles and frames and drain pans to comply with manufacturer's written instructions at locations indicated and with top of foot grilles and frames in relationship to one another and to adjoining finished flooring as recommended by manufacturer. Set foot-grille tops at height for most effective cleaning action. Coordinate top of foot-grille surfaces with doors that swing across grilles to provide clearance under door.

1. For installation in terrazzo flooring areas, provide allowance for grinding and polishing of terrazzo without grinding surface of recessed frames. Coordinate with other trades as required.

2. Install necessary shims, spacers, and anchorages for proper location and secure attachment of frames.

3. Install grout and fill around frames and, if required to set mat tops at proper elevations, in recesses under mats. Finish grout and fill smooth and level.

3.3 PROTECTION

A. After completing frame installations, provide temporary filler of plywood or fiberboard in grille recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and Project is near Substantial Completion.

END OF SECTION 124816

SECTION 14200 – VERTICAL TRANSPORTATION, GENERAL

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes vertical transportation for the entire project. The vertical transportation work includes, but is not limited to the, following:

1. All elevator work.

2. All escalator work.

3. Anchors, embedments, shims, fasteners, inserts, expansion devices, accessories, support brackets, backing and attachments for the above.

4. All testing for the above.

5. CCTV, security system, and BMS components will be incorporated into the vertical transportation work. Coordinate with the CCTV, security system, and BMS component contractors to incorporate CCTV, security system, and BMS components during the course of the Work.

B. Related work specified elsewhere includes, but is not limited to, the following:

1. General Trades:

a. Properly framed and enclosed legal hoistways, pits, pit floors and machine rooms; including necessary access doors, ladders, hoist beams, floor sump(s); and recesses to accommodate doors, sills, signal equipment, lanterns, push-buttons and other built-in parts.

b. Properly framed and finished floor openings together with supports of adequate strength properly located for truss at upper and lower landings per escalator manufacturer's drawings and data.

c. Properly framed and finished floor openings together with supports of adequate strength properly located for truss at each terminal end and transition section per moving walk manufacturer's drawings and data.

d. Blockouts, cutting, patching and chasing in, or of, walls, floors, and structural members.

e. Setting of inserts supplied under this Section.

f. Divider beams.

g. Grouting under sills and grouting around hoistway entrance frames.

h. Painting: Painting of machine room walls, floors, ceilings and equipment not installed under this Section.

i. Barricades or guards for the erection period of the vertical transportation equipment, so that the construction areas can be enclosed in accordance with applicable codes, laws or regulations and of such type as shall limit entrance to construction area.

j. Temporary power for installation and testing within hoistway and machine room.

k. Hoistway and machine room ventilation.

l. Sprinklers in the pit and the machine room of each elevator.

2. Elevator Electrical:

a. A heat and smoke, or products of combustion, sensing device outside each elevator (located in each elevator lobby, each elevator machine room, and within each hoistway) for activation of elevator emergency return feature on each floor wired to elevator controller.

b. 110 V convenience outlets and illumination in machine rooms, hoistways and pits.

c. Electrical connection to panelboard and fused disconnect devices provided in the elevator machine room.

1) In the event of a normal power supply failure, the elevator system shall operate from an emergency power supply. The emergency power supply, including transfer switch and auxiliary contacts, is provided as part of the work of Division 16 and shall be available to all the elevator(s) in the system through the normal power feeders.

a) Emergency power shall be of the same characteristics as the normal power and have the same phase rotation.

b) When normal power is restored to the building, the elevator in operation shall automatically stop at the nearest landing, be removed from service, and its motor shall be shut down. Standby power shall then be removed and, after a lapse of approximately ten seconds, normal power shall be applied to the elevator controllers. All elevators shall then be returned to service in the normal manner after expiration of a pre-set time period.

c) Provide circuitry so after normal failure and establishment of emergency power, one elevator at a time shall proceed to a pre-selected landing where it will stop with doors open and its power and operating circuits in an inoperative standby condition. After each elevator has completed its cycle, a pre-selected elevator shall resume normal operation from the emergency power supply. In the event the

selected car fails to operate, another elevator shall be automatically selected.

d) Provide a manual switch to override the automatic selection procedure.

d. Junction boxes and empty conduit, outside of the machine room and hoistway, as required, for two telephones (one emergency and one fireman=s) to telephone circuit.

e. Power for construction and testing.

f. Junction boxes and empty conduit outside of the machine room and hoistway, as required, for CCTV devices and their connection to the security system.

g. Junction boxes and empty conduit outside of the machine room and hoistway, as required, for card readers and card reader devices and their connection to the security system.

h. Junction boxes and empty conduit outside of the machine room and hoistway, as required, for connection to the remote monitoring system.

i. Sump pumps in each pit, with oil separator for each elevator.

3. Escalator Electrical:

a. Electrical connections from the power mains to and including the disconnect switch in the escalator machine spaces, including wiring, receptacles and outlets for illumination of interior of truss and escalator machine spaces, and wiring to supplementary emergency stop button. Also, whatever cutouts, circuit breakers, or other devices are necessary to meet local requirements.

b. Electrical connections from the power mains to and including the disconnect switch in the moving walk terminal end truss pits, including wiring, receptacles and outlets for illumination of interior of wellway and terminal end truss spaces, and wiring to supplementary emergency stop button. Also, whatever cutouts, circuit breakers, or other devices are necessary to meet local requirements.

c. Fully concealed sprinkler head devices and piping thereto which is located at the exposed escalator soffit closure panels.

d. Recessed light fixtures and wiring thereto which is located at the exposed soffit closure panels.

e. Electric power to provide illumination, operation of required tools and hoist and power for starting, testing and adjusting of escalators, and .

f. Junction boxes and empty conduit outside of the machine area, as required, for connection to the remote monitoring system.

4. Finished flooring surrounding floor landing plates. All patching of flooring including floor covering adjacent to the escalators, and . Any damage caused by the Contractor shall be replaced at no additional cost to the Owner.

5. Well way railing at top openings, pit edge angles, pit drains.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Award the fabrication of the vertical transportation work to one of the following firms who are specialized in the fabrication of vertical transportation equipment and who have successfully produced work similar in design and extent to that required for the project:

1. KONE Inc

2. Schindler Elevator Corp.

3. Thyssen Elevator Group North America.

4. Otis Elevator Company.

B. Installer Qualifications: Engage the vertical transportation manufacturer or an experienced Installer approved by the vertical transportation manufacturer who has completed not less than 3 elevator, escalator, and moving walk installations similar in material, design, and extent to that indicated for this Project, as determined by the Architect and Owner, for a period of 5 years and with a record of successful in-service performance and who is acceptable to the Owner.

C. Contractor's Statement: The Contractor shall furnish a statement giving a complete description of all parts wherein the vertical transportation systems that he proposes to furnish do not comply with these specifications, or are in conflict with the Contract Documents. Failure to furnish such a statement will be interpreted to mean that the Contractor agrees to meet all requirements of this specification, and any conflicts with the work of other trades brought about by the use of the selected manufacturer's equipment will not result in any added cost to the Owner.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Maine and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of elevators, escalators, and that are similar to those indicated for this Project in material, design, and extent.

E. Standards: The following standards shall govern the vertical transportation work. Where standards conflict, that standard with the more stringent requirements shall be applicable.

1. Elevator and EscalatorCode: In addition to requirements of authorities having jurisdiction, comply with the latest edition of ASME A17.1, "Safety Code for Elevators and Escalators", ASME A17.2.1 “Inspectors Manual for Electric Elevators”, ASME A17.2.2 “Inspectors Manual for Hydraulic Elevators”, ASME A17.2.3 “Inspectors Manual for Escalators and ”, and ASME A17.5 “Requirements for Elevator and Escalator Electrical Equipment”, including supplements, as published by the American Society of

Mechanical Engineers. Wherever "Code" is referred to in the vertical transportation specifications, the ASME A17.1 Code shall be implied.

a. The vertical transportation systems shall be designed to resist the seismic loads required under applicable Seismic Zone for City of Portland, Maine

2. Electrical Code: For electrical Work included in the vertical transportation Work, comply with "National Electrical Code" (ANSI C1), by NFPA, all applicable local codes, and the Authorities having jurisdiction.

3. Welding: Comply with AWS standards.

4. Americans with Disabilities Act (ADA).

F. Electrical Devices and Equipment:

1. Elevators:

a. Furnish and install all necessary wiring for proper operation of the equipment including conduit and fittings for machine rooms beginning at the light and power outlets furnished under Division 26 ELECTRICAL sections. Include all wiring and connections required to elevator devices remote from hoistway and between elevator machine rooms. Provide additional components and wiring to suit machine room layout.

b. Provide metal shielded receptacles for work lights on the underside of each platform and the crosshead of each car.

2. Escalators:

a. Furnish and install all necessary wiring for proper operation of the equipment including all wiring, conduit and fittings beginning from the disconnect switch in the escalator machine space to all electrified escalator equipment.

b. Install all conductors, except control panel wiring, in flexible conduit except short connections where equipment may require shifting for adjustments. Such wiring shall be installed in liquid tight flexible metal conduit.

c. Provide flame retardant panel wiring.

3. All electrical and wiring interconnections shall comply with the governing codes, ASME A17.1 and NFPA 70.

a. Conductors: Copper throughout with individual wires coded and all connections at accessible, numbered terminal blocks and connected with lugs and pressure connectors. Use no splices or similar connections in wiring except at terminal blocks, control cabinets, junction boxes and conduits. Provide 10% spare conductors throughout.

b. Elevator Traveling Cables: All wiring shall be insulated with a moistureproof, flame retardant, outer covering and shall be run in tubing, conduit, or electrical wireways. Provide flexible traveling cables which are properly suspended to relieve stress on individual cables. Provide six (6) pairs of 18 ga. shielded wire in the traveling cables for telephone or other electronic equipment in the car. Terminate them to barrier-type terminal strip behind each elevator return panel at one end of cable and within a machine room security junction box. Provide one traveling coax cable for CCTV equipment in the car. Prevent traveling cables from rubbing or chafing against hoistway or car items.

c. Conduit and Fittings: Galvanized steel conduit. Minimum conduit size shall be 3/4" diameter unless larger size is required per NFPA 70 for use intended. Fittings may be steel compression type unless otherwise permitted by NFPA 70.

G. Testing and Inspections: Advise the Owner, Architect and governing agencies in advance of dates and times that tests and inspections are to be performed.

1. Regulatory Testing and Inspections: Upon nominal completion of each elevator, escalator, and moving walk installation, and before permitting use of the same (either temporary or permanent), perform tests as required and recommended by the "Code" and by governing regulations and agencies. Verification that such tests have been completed, all corrective work accomplished and installation approved for issuance of a permit or certificate to operate, shall be required before acceptance of each unit.

a. Before final acceptance, the Contractor shall furnish permits, or certificates, by the Building Department or other City, County or State departments having legal jurisdiction, as required to allow the use of each unit. All certificates shall be furnished to the Owner through the Contractor.

2. Acceptance Testing: Upon completion of each elevator, escalator, and moving walk installation and before final acceptance, make a contract load test of each in the presence of the local authorities having jurisdiction with full maximum load, (or in accordance with local code requirements) to determine whether the equipment as installed meets the speed, capacity and all other requirements of the specifications.

G. Manufacturer Labeling: Names, trademarks and other identifying symbols shall not be permitted on surfaces visible to the public.

H. Obtain and pay for permits, fees, licenses, and inspections necessary to complete the vertical transportation installations.

1.3 SUBMITTALS

A. Reference Submittals:

1. Warranty: Submit a copy of the following written warranty for the vertical transportation work. The Contractor will correct defects and non-compliant work which develop or become known within one year from the date of acceptance by Owner to the satisfaction of the Owner and Architect at no additional cost. Make modifications, adjustments, improvements, etc., to meet the specified performance requirements. No earlier than 1

month prior to the conclusion of the warranty period each elevator, escalator, and moving walk, will be inspected jointly by the Owner, the Owner's vertical transportation maintenance service contractor and the Contractor. All maintenance and warranty deficiencies requiring correction by the Contractor shall be mutually agreed to at this time. A written report shall be provided by the Owner detailing the required actions.

a. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Shop Drawings, Product Data, and Samples: Refer to the following sections for requirements relating to shop drawings:

1. Section 14 21 00, ELECTRIC TRACTION ELEVATORS.

2. Section 14 24 00, HYDRAULIC ELEVATORS

3. Section 14 31 00, ESCALATORS.

C. Certificates and Permits: Submit inspection and acceptance certificates and operating permits as required by authorities having jurisdiction for normal, unrestricted use of vertical transportation systems.

1.4 JOB CONDITIONS

A. Temporary Use: Do not use vertical transportation components during construction period, unless and until recommended by Architect and permitted in writing by the Owner.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Protect vertical transportation work components during delivery storage, handling, erection and construction period against damage and stains.

B. Do not deliver the vertical transportation components to Project site until they can be placed in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Refer to the following specification sections for materials, components and fabrication criteria for the vertical transportation systems:

1. Section 14 21 00, ELECTRIC TRACTION ELEVATORS.

2. Section 14 24 00, HYDRAULIC ELEVATORS

3. Section 14 31 00, ESCALATORS.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the spaces and areas to receive the vertical transportation work, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of the vertical transportation work. Examine wellways, hoistways, hoistway openings, pits, terminal end truss pits, and machine rooms, as constructed; verify critical dimensions; and examine supporting structure and other conditions under which vertical transportation work is to be installed. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Verify dimensions of supporting structure from the working drawings and shop drawings so that the vertical transportation work will be accurately fabricated and fitted to the structure. The Contractor shall satisfy himself by review of the working drawings that the clearances and the alignments are proper for the installation of his equipment.

B. Coordinate vertical transportation work with the work of other trades and provide items to be placed during the installation of other work at the proper time so as to avoid delays in the overall work. Place such items, including inserts and anchors, accurately in relation to the final location of vertical transportation components. Use Contractor's bench marks.

3.3 INSTALLATION

A. General: Install component parts of the vertical transportation work in accordance with referenced standards and the manufacturers printed instructions and recommendations, unless otherwise shown or specified. Keep work areas orderly and free from debris during progress of the work. Remove all loose materials and filings resulting from this work from well way and hoistway surfaces.

B. Elevator Hoistway Entrances: Coordinate the installation of hoistway entrances with the installation of elevator guide rails, for accurate alignment of entrances with cars. Wherever possible, delay the final adjustment of sills and doors until the car is operable in the shaft. Set sills flush with finished floor surface at landings. Reduce clearances between hoistway entrance sill and car sill to minimum, safe, workable dimension at each landing. Hanger supports shall be erected in perfect alignment, with edges of the sills, sill grooves and head jambs to insure smooth operation of the doors. Guide grooves in the thresholds shall be cleaned and free of debris.

C. Elevator Guide Rails: Erect guide rails plumb and parallel and secure guide rail joints without gaps and file any irregularities to a smooth surface. Fasten guider rail brackets to concrete structures with proper inserts and insert bolts, through bolts, or adhesive anchors. Fasten guide rail brackets to structural steel with through bolts and attach guide rails to brackets with throughbolts or steel clips. Compensate for expansion and contraction movement of guide rails. Balance cars to equalize pressure of roller guide shoes on rails.

D. Escalators: Set escalators true to line and level, or to indicated slope, properly supported, and anchored to building structure. Use established benchmarks, lines, and levels to ensure dimensional coordination of the Work.

E. Machine Room and Machine Space Equipment: Install machine room and machine space equipment with clearances complying with the referenced codes and standards. Install items so that they may be removed by portable hoists or other means for maintenance and/or repair. Install items so that access for maintenance is safe and readily available. Mount rotating and vibrating equipment on vibration-isolating mounts designed to effectively prevent transmission of vibrations to structure and thereby, eliminate sources of structure-borne noise from vertical transportation equipment.

1. Pack wall openings thru which oil lines and conduit pass with fire resistant, sound isolating, mineral wool insulation and fire stopping material.

F. Lubrication and Adjustment: Adjust installed components for smooth, efficient operation, complying with required tolerances and free of hazardous conditions.

1. Electric Traction Elevators: Lubricate operating parts of system including ropes. Adjust motors, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.

2. Hydraulic Elevators: Lubricate operating parts of system. Adjust pumps, valves, motors, brakes, controllers, leveling switches, limit switches, stopping switches, door operators, interlocks and safety devices to achieve required performance levels.

3. Escalators: Lubricate operating parts, including bearings, tracks, chains, guides, and hardware. Test operating devices, equipment, signals, controls, and safety devices. Install oil drip pans and verify that no oil drips outside of pans.

a. Install glass balustrades without the use of mullions.

3.4 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to the vertical transportation Installer, that ensure vertical transportation equipment is without damage or deterioration at the time of acceptance by Owner.

B. Repair damaged finishes so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop, make required repairs and refinish entire unit, or provide new units as required.

3.5 FIELD QUALITY CONTROL

A. General: On completion of each type of vertical transportation equipment installation and before permitting use thereof, perform acceptance tests as required and recommended by ASME A17.1, procedures with the following additions or adaptations, and by authorities having jurisdiction.

1. Traction Elevators: Comply with ASME 17.2.1 Inspectors Manual for Electric Elevators, procedures.

2. Hydraulic Elevators: Comply with ASME 17.2.2 Inspectors Manual for Hydraulic Elevators procedures.

3. Escalators: Comply with ASME 17.2.3 Inspectors Manual for Escalators procedures and the following:

   a. Contractor shall perform the following tests on each escalator without load:

      1) Comb impact device shall be tested and calibrated with an appropriate scale at both ends of the escalator in both the horizontal and vertical direction.

      2) Brakes: Measure deceleration rate with no load over 5 consecutive stops in the down direction using test equipment designed to obtain this information.

   b. Contractor shall perform the following tests on each escalator under full load:

      1) Brake test. The stopping distance in the down direction shall meet all requirements of ASME A17.1.

      2) Twenty Four Hour Test: Each escalator shall be operated continuously for 24 hours after the acceptance test with no faults. If any fault occurs that shuts the escalator down, the fault shall be corrected. Run additional 24 hour tests until all faults are corrected.

B. Perform testing during times approved by the Owner and the Architect. Perform tests that are disruptive to normal building operations, as determined by the Owner, after normal building occupancy hours.

   1. Supply all required labor, material, supervision, material, tools, test weights and test instruments for all required tests, inspections and reviews.

   2. In all elevator test conditions, obtain specified speed, performance times, floor accuracy without re-leveling, and ride quality.

   3. In all escalator, moving walk test conditions, obtain specified speed, and ride quality.

   4. Label each device with calibration sticker indicating test results and date of test.

C. Performance Guarantee: Should these tests indicate defects or poor workmanship, variance or noncompliance with the requirements of the specified codes and/or ordinances or variance or noncompliance with the requirements of these specifications, the following work and/or repairs shall be completed at no expense to the Owner.

   1. Replace all equipment that does not meet Code or specification requirements.

   2. Perform all work and furnish all materials and equipment necessary to complete the specified operation and/or performance.

3. Perform all retesting required by the governing Code Authority and the Owner to verify the specified operation and/or performance.

3.6 DEMONSTRATE, INSTRUCT

A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators. Review emergency provisions, including emergency access and procedures to be followed at time of failure in operation and other building emergencies. Train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Confer with Owner on requirements for a complete vertical transportation maintenance program.

B. Make a final check of each type of vertical transportation equipment with Owner's personnel present and before date of acceptance by the Owner. Determine that operation systems and devices are functioning properly.

END OF SECTION 14 20 00

SECTION 14 21 00 – ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section specifies electric traction elevators.

B. Work Required:

1. The work required under this section consists of all labor, materials and services required for the complete installation (including operational verification) of all the equipment required for the elevator(s) as herein specified.

2. All work shall be performed in a first class, safe and workmanlike manner.

3. In all cases where a device or part of the equipment is herein referred to in the singular, it is intended that such reference shall apply to as many of such devices or parts as are required to make complete installation.

C. Related work not specified herein: The following sections contain requirements that relate to this section and are performed by trades other than the elevator manufacturer/installer.

1. Section 01 50 00 - Construction Facilities and Temporary Controls: protection of floor openings and personnel barriers; temporary power and lighting.
2. Section 31 20 00 - Earthwork: excavation for elevator pit.
3. Section 03 30 00 - Cast-In-Place Concrete: elevator pit, and elevator machine foundation.
4. Section 04 20 00 - Unit Masonry: masonry hoistway enclosure, building-in and grouting hoistway doorframes, and grouting of sills.
5. Section 05 50 00 - Metal Fabrications: pit ladder, divider beams, and supports for entrances, rails and hoisting beam at top of elevator machine room.
6. Section 07 16 19 – Metal Oxide Waterproofing: waterproofing of elevator pit.
7. Division 23 - Heating, Ventilating, and Air Conditioning: ventilation and temperature control of elevator equipment areas.
8. Division 26 - Electrical:
   a. Main disconnects for each elevator.
   b. Electrical power for elevator installation and testing.
   c. Disconnecting device to elevator equipment prior to activation of sprinkler system.
   d. The installation of dedicated GFCI receptacles in the pit and overhead (with Machine room-less).
   e. Lighting in controller area, machine area and pit.
   f. Wiring for telephone service to controller.
9. Division 26 – Emergency (Standby) Power Supply Systems: emergency generator for elevator operation.
10. Section 28 31 00 - Fire Alarm Systems: The installation of fire and smoke detectors at required locations and interconnecting devices; fire alarm signal lines to contacts in the machine room.
11. Division 27 - Telephone Systems: ADAAG-required emergency communications equipment.

D. Applicable Codes: Comply with applicable building codes and elevator codes at the project site, including but not limited to the following:

1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People.
2. ADAAG, Americans with Disabilities Act Accessibility Guidelines.
3. ANSI/NFPA 70, National Electrical Code.
4. ANSI/NFPA 80, Fire Doors and Windows.
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.
6. ANSI/UL 10B, Fire Tests of Door Assemblies.
7. CAN/CSA-B44, Safety Code for Elevators and Escalators.
8. EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"
9. International Building Code, 2003 ed.
10. Maine State Elevator Code
11. All other local applicable codes.

1.03 SYSTEM DESCRIPTION ELEVATOR NO. 8 (SERVICE)

A. Equipment Description: Gen2™ gearless traction elevator with Machine Room-less application.

B. Equipment Control: Elevonic® Control System.

C. Quantity of Elevators: refer to drawings

D. Elevator Stop Designations: refer to drawings

E. Stops (maximum): refer to drawings

F. Openings: In line

G. Travel (maximum): 200 fpm- 196 ft (60 m)

H. Rated Capacity: 5000 lb.

I. Rated Speed: 200 fpm

J. Platform Size: 5' 9-1/2" W x 9' 0-9/16" D

K. Clear Inside Dimensions: 5' 8-5/16" W x 9' 0" D

L. Cab Height: 8' 0"

M. Clear height under suspended ceiling: 8' 0"

N. Entrance Type and Width: Two-Speed Doors 4' 0"

O. Entrance Height: 8' 0" (2438mm)

P. Main Power Supply: [Select one] 208, 240, 440, 480 or 600 Volts + or - 5% of normal, three-Phase, with a separate equipment grounding conductor.

Q. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.

R. Machine Location: Machine Room-Less

S. Signal Fixtures: Manufacturer's standard.

T. Controller Location: Machine Room-Less Controller(s) as located on the drawings.

U. Performance:

1. Car Speed: ± 3 % of contract speed under any loading condition or direction of travel.
2. Car Capacity: Safely lower, stop and hold up to 125% of rated load. (code required).

V. Ride Quality:

1. Vertical Vibration (maximum): 12 – 17 milli-g
2. Horizontal Vibration (maximum): 10 – 15 milli-g
3. Vertical Jerk (maximum): 4.6 ± 1.0 ft./ sec^3 (1.4 ± 0.3 m/ sec^3)
4. Acceleration/Deceleration (maximum): 2.6 ± .33 ft./ sec^2 (0.8 ± 0.13 m/ sec^2)
5. In Car Noise: 50 – 55 dB(A)
6. Stopping Accuracy: ± 0.2 in. (± 5 mm)
7. Re-leveling Distance: ± 0.4 in. (± 10 mm)

W. Operation:.

Duplex Collective Operation: Using a microprocessor-based controller, the operation shall be automatic by means of the car and hall buttons. In the absence of system activity, one car can be made to park at the pre-selected main landing. The other (free) car shall remain at the last landing served. Only one car shall respond to a hall call. If either car is removed from service, the other car shall immediately answer all hall calls, as well as its own car calls.

X. Operating Features – Standard

1. Full Collective Operation
2. Anti-nuisance.
3. Fan and Light Protection.
4. Load Weighing Bypass.
5. Independent Service.
6. Full Collective Operation.
7. Firefighters' Service Phase I and Phase II
8. Top of Car Inspection.
9. Zoned Car Parking.
10. Relative System Response Dispatching.
11. MRO Manual Rescue Operation

Y. Operation Features

1. Car Secure Access.
2. Provision for Card Reader in Car (Card Reader provided and Installed by others).
3. Automatic Standby Power Operation with Manual Override.

This operation shall return each car automatically to a designated landing when the system is initially switched to standby power. One or more cars are returned at a time. Preference is given to loaded cars over empty cars in order to reduce passenger wait times. A car must respond by beginning to move toward the designated landing within a pre-determined time. If a car does not respond, it is automatically placed in a "Not Available" mode while other cars are moved. If a car was not returned to the designated landing on the first try, a second attempt is made. If the second

attempt is not successful, the car will remain in a "Not Available" mode and can only be moved by manual means. Once each car has returned to the designated landing, the doors will remain open for a predetermined amount of time.

When all cars have successfully returned to the designated landing or have attempted to move twice, automatic selection of the car(s) to run on normal operation will occur.

If for any reason a car selected for normal operation under standby power is delayed for 60 seconds, the car will be placed in a "Not Available" mode and another car will be selected for normal operation based on the priorities listed above.

Manual Override of Standby Power Operation is achieved by a manual input for each car via a strip switch. A manually selected car may be run either in a return operation to a designated landing or in normal operation under standby power. If a manually selected car has not yet returned to the designated landing, it will perform this operation first then immediately go into normal operation.

If a manually selected car is delayed, no other car can be selected in the group unless it is manually selected.

If car selection is changed by Manual Override while a car is running in return or normal operation under standby power, the newly selected car will not be permitted to run until the car that had been running has stopped, opened its doors, and gone into the Standby Power Wait state.

Z. Door Control Features:

1. Door control to open doors automatically when car arrives at a landing in response to a normal hall or car call.

2. Elevator doors shall be provided with a reopening device that will stop and reopen the car door(s) and hoistway door(s) automatically should the door(s) become obstructed by an object or person.

   Primary door protection shall consist of a two dimensional, multi-beam array projecting across the car door opening. Under normal operation and for any door position, the system shall detect as a blockage an opaque object that is equal to or greater than 1.3 inches (33 mm) in diameter when inserted between the car doors at vertical positions from within 1 inch (25 mm) above the sill to 71 inches (1800 mm) above the sill. Under degraded conditions (one or more blocked or failed beams), the primary protection shall detect opaque objects that are equal to or greater than 4” (100 mm) in diameter for the same vertical coverage. If the system performance is degraded to the point that the 4” object cannot be detected, the system shall maintain the doors open or permit closing only under nudging force conditions.

   The door reopening device shall also include a secondary, three dimensional, triangular infrared multi-beam array projecting across the door opening and extending into the hoistway door zone. The door opening device will cause the doors to reopen when it detects a person(s) or object(s) entering or exiting the car in the area between the hoistway doors or the entryway area adjacent to the hoistway doors.

   The size of the secondary protection zone shall vary as the door positions vary during opening and closing. The width of the zone shall be approximately one-third the size of the separation between the doors (or door and strike plate for single-slide doors) and shall be approximately

centered in the door separation. In order to minimize detection of hallway passers-by who are not entering the elevator, the maximum zone penetration into the entryway shall not exceed 20" for any door separation. Normal penetration depth into the entryway from the car doors shall be ~14" for a door separation of 42". The penetration shall reduce proportionally as the doors close. At door separations of 18" or less the secondary protection system may cease its normal operation since the depth of the zone recedes to where it is inside the hoistway doors. The vertical coverage of the secondary protection shall be ~19" (480 mm) above the sill to ~55" (1400 mm) above the sill (mid-thigh to shoulder of a typical adult).

The secondary protection shall have an anti-nuisance feature that will ignore detection in the secondary zone after continual detection occurs for a significant time period in the secondary zone without corresponding detection in the primary protection zone; i.e. a person/object is in the entryway but does not enter. Normal secondary protection shall be re-enabled whenever detection occurs in the primary zone.

The reaction time of the door detector sub-system shall not exceed 60 milliseconds when both primary and secondary protection capabilities are active; nor 40 milliseconds when the secondary protection is disabled.

3. Door nudging operation to occur if doors are prevented from closing for an adjustable period of time.

AA. Provide equipment according to IBC seismic use group II

1.04 SUBMITTALS

A. Product Data: Submit manufacturer's product data for each system proposed for use. Include the following:

1. Signal and operating fixtures, operating panels and indicators.
2. Cab design, dimensions and layout.
3. Hoistway-door and frame details.
4. Electrical characteristics and connection requirements.
5. Expected heat dissipation of elevator equipment in control room space and machine space (BTU).
6. Color selection chart for Cab and Entrances.

B. Shop Drawings: Submit approval layout drawings. Include the following:

1. Car, guide rails, buffers and other components in hoistway.
2. Maximum rail bracket spacing.
3. Maximum loads imposed on guide rails requiring load transfer to building structure.
4. Clearances and travel of car.
5. Clear inside hoistway and pit dimensions.
6. Location and sizes of access doors, hoistway entrances and frames.

C. Operations and Maintenance Manuals: Provide manufacturer's standard operations and maintenance manual.

1.05 QUALITY ASSURANCE

A. Manufacturer: Elevator manufacturer shall be ISO 9002 certified.

B. Installer: Elevators shall be installed by the manufacturer.

C. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.

1.06 DELIVERY, STORAGE AND HANDLING

A. Should the building or the site not be prepared to receive the elevator equipment at the agreed upon date, the General Contractor will be responsible to provide a proper and suitable storage area on or off the premises.

Should the storage area be off-site and the equipment not yet delivered, then the elevator contractor, upon notification from the General Contractor, will divert the elevator equipment to the storage area. If the equipment has already been delivered to the site, then the General Contractor shall transport the elevator equipment to the storage area. The cost of elevator equipment taken to storage by either party, storage, and redeliver to the job site shall not be at the expense of the elevator contractor.

1.07 WARRANTY

A. The elevator contractor's acceptance is conditional on the understanding that their warranty covers defective material and workmanship. The guarantee period shall not extend longer than one (1) year from the date of completion or acceptance thereof by beneficial use, whichever is earlier, of each elevator. The guarantee excludes: ordinary wear and tear or improper use, vandalism, abuse, misuse, or neglect or any other causes beyond the control of the elevator contractor and this express warranty is in lieu of all other warranties, express or implied, including any warranty of merchantability or fitness for a particular purpose.

1.08 MAINTENANCE and SERVICE

A. Maintenance service consisting of regular examinations and adjustments of the elevator equipment shall be provided by the elevator contractor for a period of twelve (12) months after the elevator has been turned over for the customer's use. This service shall not be subcontracted but shall be performed by the elevator contractor. All work shall be performed by competent employees during regular working hours of regular working days and shall include emergency 24-hour callback service. This service shall not cover adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents caused by persons other than the elevator contractor. Only genuine parts and supplies as used in the manufacture and installation of the original equipment shall be provided.

B. The periodic lubrication of elevator components shall <u>not</u> be required, including: Sheaves, Rails, Belts, Ropes, Car and CWT guides, etc.

C. The elevator control system must:

1) Provide in the controller the necessary devices to run the elevator in inspection operation.
2) Provide on top of the car the necessary devices to run the elevator in inspection operation.
3) Provide in the controller an emergency stop switch. This emergency stop switch when opened

disconnects power from the brake and prevents the motor from running.
4) Provide in the event of a power outage, means from the controller to electrically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
5) Provide the means from the controller to reset the governor over speed switch and also trip the governor.
6) Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed..

PART 2 - PRODUCTS

2.01 DESIGN AND SPECIFICATIONS

A. Provide machine room-less Gen2™ traction passenger elevators from Otis Elevator Company with front and rear doors at stops indicated on drawings. The control system and car design based on materials and systems manufactured by Otis Elevator Company. Specifically, the system shall consist of the following components:

1. An AC gearless machine using embedded permanent magnets mounted Machine Room-Less at the top of the hoistway
2. Polyurethane Coated Steel Belts (CSB's) for elevator hoisting purposes.

B. Approved Installer: Otis Elevator

2.02 EQUIPMENT: CONTROL ROOM COMPONENTS

A. Controller: A microcomputer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed so as to be physically segregated from the rest of the controller.
3. Field conductor terminations points shall be segregated; high voltage (>30 volts DC and 110 VAC,) and low voltage (< 30 volts DC)
4. Controllers shall be designed and tested for Electromagnetic Interference (EMI) immunity according to the EN 12016 (May 1998): "EMC Product Family Standards for lifts, escalators, and passenger conveyors Part 2 – immunity"

B. Drive: A Variable Voltage Variable Frequency AC drive system shall be provided.

C. Control space barrier: Provide control space barrier consisting of a bi-folding barrier system that can be opened out of the room to provide protection during service.

2.03 EQUIPMENT: MACHINE AND GOVERNOR

A. Machine: Machine Room-Less AC gearless machine, with a synchronous permanent-magnet motor, dual solenoid service and emergency disc brakes, mounted at the top of the hoistway.

B. Governor: Machine Room-Less

C. Buffers, Car and Counterweight: Compression spring type buffers shall be used.

D. Hoistway Operating Devices:
1. Emergency stop switch in the pit
2. Terminal stopping switches.

E. Positioning System: Consists of an encoder, reader box, and door zone vanes.

F. Guide Rails and Attachments: Guide rails shall be Tee-section steel rails with brackets and fasteners. Side counterweight arrangements shall have a dual-purpose bracket that combines both counterweight guide rails, and one of the car guide rails to building fastening.

G. Coated Steel Belts: Polyurethane coated belts with high-tensile-grade, zinc-plated steel cords.

H. Governor Rope: Governor rope shall be steel and shall consist of at least eight strands wound about a sisal core center.

I. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.

J. Hoistway Entrances:

1. Frames: Entrance frames shall be of bolted construction for complete one-piece unit assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and shall be of UL fire rated steel.

2. Sills shall be extruded aluminum

3. Doors: Entrance doors shall be of hollow metal construction with vertical internal channel reinforcements.

4. Fire Rating: Elevator 10 entrance and doors shall be UL fire rated for 1-1/2 hour.

5. Entrance Finish: satin stainless steel

6. Entrance marking plates: Entrance jambs shall be marked with 4” x 4” (102 mm x 102 mm) plates having raised floor markings with Braille located adjacent to the floor marking. Marking plates shall be provided on both sides of the entrance.

7. Sight Guards: Black sight guards will be furnished with any metal finish door. Powder-coated matching sight guards will be furnished with powder-coated doors.

L. Counterweight Safeties: Counterweight safeties shall be applied to the counterweight frame, and shall be either a type “D” or “E”, flexible guide clamp type.

2.04 EQUIPMENT: CAR COMPONENTS

A. Carframe and Safety: A carframe fabricated from formed or structural steel members shall be provided with adequate bracing to support the platform and car enclosures. The car safety shall be integral to the carframe and shall be Type "B", flexible guide clamp type.

B. Steel Cab: Series 4 cab with brushed stainless steel

C. Car Front Finish: satin stainless steel

D. Car Door Finish: satin stainless steel

E. Car Top: shall be of ½" (12.7 mm) thick structural wood material clad on both sides with a 1/32" (0.79 mm) natural finish aluminum panel.

F. Ceiling Type:
Ceiling by Others DC29 Unfinished car top with exposed hardware. No suspended ceiling with fluorescent lighting mounted to the canopy. Canopy to be natural aluminum. Refer to drawings for finishes.

G. Emergency Car Lighting: An emergency power unit employing a 6-volt sealed rechargeable battery and totally static circuits shall be provided to illuminate the elevator car and provide current to the alarm bell in the event of building power failure.

H. Emergency Pulsating Siren: Siren mounted on top of the car that is activated when the Alarm button in the car operating panel is engaged. Siren shall have a rated sound pressure level of 80 dB(A) at a distance of 3.0 m from the device. Siren shall respond with a delay of not more than 1 second after the switch or push button has been pressed.

I. Fan:

A two-speed 120 VAC fan will be mounted to the structural ceiling to facilitate in-car air circulation, meeting A17.1 code requirements. This two-speed fan produces airflow rates of 7.2 and 9.2 m^3/min on low and high setting respectively. The fan shall be rubber mounted to prevent the transmission of structural vibration and will include a baffle to diffuse audible noise. A switch shall be provided in the car-operating panel to control the fan.

J. Handrails: refer to drawings

K. Threshold: aluminum

L. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

M. Roller Guides: Rubber roller guides shall be mounted on the top and the bottom of the car and counterweight. Car roller guides shall be 3" (76mm)

N. Platform: The car platform shall be constructed of 2 layers of plywood and 2 layers of .032" (.81mm) thick aluminum laminate for a total thickness of 1-1/2" (38mm). Load weighing device shall be mounted under the platform.

O. Certificate frame: Provide a Certificate frame with a satin stainless steel finish.

2.05 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons, key switches, and message indicators for elevator operation. The car operating panel shall have a satin stainless steel finish.

1. Applied car operating panel shall be furnished. It shall contain a bank of round metal mechanical illuminated buttons. Flush mounted to the panel and marked to correspond to the landings served, an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. The emergency call button shall be connected to a bell that serves as an emergency signal. All buttons to have raised numerals and Braille markings. Red LED halo illumination with Flat Flush targets. Target finishes: satin stainless steel

The car operating panel shall be equipped with the following features:

Standard:
1) Raised markings and Braille shall be provided to the left hand side of each push-button.
2) Car Position Indicator at the top of and integral to the car operating panel.
3) Door open and door close buttons.
4) Light key-switch.
5) Fan key-switch.
6) Inspection key-switch.
7) Elevator Data Plate marked with elevator capacity and car number.
8) Illuminated alarm button with raised markings
9) In car stop switch (toggle or key unless local code prohibits use)
10) Firefighter's hat (standard USA)
11) Firefighter's Phase II Key-switch (standard USA)
12) Call Cancel Button (standard USA)

Optional

1) Help Button – The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
2) Firefighter's Phase II emergency in-car operating instructions, worded according to A17.1 2000, Article 2.27.7.2.
3) Landing Passing Signal: A chime bell shall sound in the car to signal that the car is either stopping at or passing a floor served by the elevator.
4) Please exit symbol, provided with emergency hospital service, Seismic Zones ≥2 or express priority in the hall.

B. Car Position Indicator: A 16-segment, digital, vacuum fluorescent car position indicator shall be integral to the car operating panel.

C. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation.

1. Hall fixtures shall feature round mechanical buttons marked to correspond to the landings, in raised fixture housings. Buttons shall be flat flush in vertically mounted fixture. Hall Lanterns and Position indicators shall be illuminated by means of LED. Fixture shall be satin stainless steel finish.

D. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound.

E. Telephone Cabinet: A telephone compartment shall be furnished in the return panel below the car operating panel. Necessary wires for the telephone shall be included in the compartment and connected to the car traveling cable. The telephone instrument shall be furnished by others.

F. Card reader provisions, 4 twisted shielded pairs in traveling cable.

G. Emergency (standby) Power key-switch: Manual selection of each elevator in normal operation after automatic return in standby power operation has been initiated.

PART 3 - EXECUTION

3.01 PREPARATION

A. Take field dimensions and examine conditions of substrates, supports, and other conditions under which this work is to be performed. Do not proceed with work until unsatisfactory conditions are corrected.

3.02 INSTALLATION

A. Installation of all elevator components except as specifically provided for elsewhere by others.

3.03 DEMONSTRATION

A. The elevator contractor shall make a final check of each elevator operation with the Owner or Owner's representative present prior to turning each elevator over for use. The elevator contractor shall determine that control systems and operating devices are functioning properly.

END OF SECTION 14 21 00

SECTION 14 24 00 – HYDRAULIC ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes hydraulic elevators.

1. CCTV, security system, and BMS components will be incorporated into the hydraulic elevator work. Coordinate with the CCTV, security system, and BMS component contractors to incorporate CCTV, security system, and BMS components during the course of the Work.

B. Single Subcontract Responsibilities: Refer to Section 14 20 00 VERTICAL TRANSPORTATION, GENERAL for the requirements of single subcontract responsibilities for hydraulic elevators.

1.2 QUALITY ASSURANCE

A. Manufacturer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

B. Installer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

C. Professional Engineer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

D. Standards: The following standards shall govern the elevator work. Where standards conflict, that standard with the more stringent requirements shall be applicable.

1. Elevator Code: In addition to requirements of authorities having jurisdiction, comply with the latest edition of ASME A17.1, "Safety Code for Elevators and Escalators", ASME A17.2.2 “Inspectors Manual for Hydraulic Elevators”, and ASME A17.5 “Requirements for Elevator and Escalator Electrical Equipment”, including supplements, as published by the American Society of Mechanical Engineers. Wherever "Code" is referred to in the elevator specification, the ASME A17.1 Code shall be implied.

a. The elevators shall be designed to resist the seismic loads required under Seismic Zone 2A of the 1988 Uniform Building Code (UBC). Conform to the applicable portions of Part XXIV ‘Elevator Safety Requirements for Seismic Risk Zone 2 or Greater’ of ASME A17.1.

2. Electrical Code: For electrical Work included in elevator Work, comply with "National Electrical Code" (ANSI C1), by NFPA , all applicable local codes, and the Authorities having jurisdiction.

3. Welding: Comply with AWS standards.

4. Americans with Disabilities Act (ADA).

5. International Building Code, 2003 ed

6. Maine State Elevator Code

E. Electrical Devices and Equipment: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

F. Manufacturer: Provide all elevator components from a single source. Where equipment or operation varies from those described, the manufacturer shall provide a complete description of those variations as required under Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL, Article QUALIFICATIONS, paragraph 'Contractor Statement'.

G. Tolerances: Plumb and secure guide rails within an overall tolerance of 1/4" and within 0.01" joint offset on rail surfaces. Limit short-span plumb tolerance (measured between upper and lower car guides, continuously) to 1/8" +/- 1/16".

H. Testing and Inspections: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.3 SUBMITTALS

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

B. Warranty and Maintenance Agreement: Warranties and maintenance agreements are required, refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

C. Maintenance and Operating Instructions: Maintenance and operating instructions are required, refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL

D. Shop Drawings: Submit complete information for all components for review prior to commencement of the fabrication of elevator work. Items which shall be detailed shall include the following:

1. Typical sections of the elevator shafts, full height, at the scale of 1/4" = 1'-0". Indicate car, machine, guide rails, rail bracket spacing, buffers, sheaves, ropes, ladder, hydraulic cylinder assemblies, and other components in hoistway. Indicate clearances of car. Indicate platform, hoistway and entrance dimensions. Indicate locations of inserts.

2. Typical plan of each elevator machine room, at the scale of 1/4" = 1'-0". Show arrangement of all equipment including, but not limited to, the drive machine, controller selector, motor, controller, pump unit, and governor.

3. Load assumptions for maximum loads imposed on guide rails requiring load transfer to building structural framing, individual weight of principal components and their load reactions at points of support, loads on hoisting beam, expected heat dissipation of

elevator equipment in machine room, electrical characteristics and connection requirements, and any other information required by the Architect.

a) Structural Calculations: Submit, for information only, copies of structural calculations indicating load assumptions. Calculations shall be signed, and sealed by the qualified Professional Engineer responsible for their preparation.

4. Complete single line wiring diagrams of all circuits in the system, and parts catalogues. Show component location within system, terminals with numbers, connection between components, and conductor identification, include an explanation of basic operation.

5. Complete hydraulic piping diagrams of all piping in the system.

6. Detail drawings of the elevator cars and elevator hoistway entrances. Include elevation, floor plan, reflected ceiling plan and complete details of doors, frames, controls, fixtures and all accessory equipment.

7. Provide a record set of drawings with all of the changes made during the installation of the work. At the completion of the job, submit for the Owner's use a complete set of "AS INSTALLED" plans and wiring diagrams.

E. Product Data: Submit manufacturer's specifications and installation instructions for each component or product used in the system, a listing and description of performance and operating characteristics, the maximum and average power demands, and requirements for temporary power.

1. Provide the Owner with special tools, solid state microprocessor tools, including appropriate programs relative to the specific type of microprocessor or computer controls installed on this project, necessary to trouble shoot, service, test and maintain the elevators. Special tools become the property of the Owner. Tools provided shall be useable throughout the life of the equipment.

a. Tools may be hand held or built into the control system and may be factory programmed to operate only with this project’s equipment.

F. Samples: Submit samples as follows:

1. 4" x 3" each metal finish required; acceptable low and high range of variation in color and finish shall be governed by control samples in the Architect’s office.

2. Hall lanterns and call buttons; samples will be returned for use in the project after approval.

3. 4" x 3" car finish materials, including plastic laminate and other finishes scheduled or shown.

G. Certificates and Permits: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.4 JOB CONDITIONS

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

PART 2 - PRODUCTS

2.1 MATERIALS AND COMPONENTS

A. Materials, General:

1. Sheet Steel (for unexposed work): Hot rolled, commercial quality carbon steel, pickled and oiled, complying with ASTM A569.

2. Structural Steel Shapes and Plates: ASTM A6 and ASTM A36.

3. Steel Component and Machinery Finish: Clean exposed metal parts, assemblies, machinery and equipment of oil, grease, scale, and other foreign matter and factory paint with one coat of rust-resistant primer.

4. Fasteners: Type and size as required; exposed fasteners will not be acceptable.

5. Stainless Steel: Provide the forms and types shown and specified for each item of work; minimum 14 ga. (U.S. Standard Gauge). Provide in standard commercial tempers and hardness, as required for fabrication, strength and durability.

a. Sheet and Plate: ASTM A666, Type 304.

b. Barstock: ASTM A276, Type 304.

c. Tubing: ASTM A 554, Grade MT 304.

d. Pipe: ASTM A 312/A 312M, Grade TP 304.

6. Stainless Steel Finish: All sheet goods shall be provided finished one side only. Finish texture and reflectivity as required to match the Architect's sample which has been selected from the following:

a. Fine Satin Finish: (No. 4, Bright Directional Polish). Provide graining direction as shown, or if not shown, as approved on shop drawings.

9. Nickel-Silver Sills: Comply with CDA Alloy 774; groove surface with not lees than ¼" thickness of metal when measured at ribs.

B. Hoistway Components: Fabricate hoistway components in accordance with the ASME A17.1 Code and the following:

1. Provide rail guides, brackets, and backing fabricated from steel.

    a. Rails shall be machined, steel T section guide rails of suitable size and weight for the application.

    b. Brackets shall be used to support the rails from the hoistway framing and or inserts. The rails shall be attached to the brackets by heavy clamps or clips.

    c. Provide rail backing where the vertical distance between support framing is greater than 14'-0" (for car guide rails), and no intermediate support framing is shown on the drawings.

2. Carframe (Shell and Canopy): Welded or bolted steel channel and steel sheet construction. Where the upper part of the car is braced to the frame, acoustical pads shall effectively isolate the car from the frame. Spray to back of shell and canopy sheet metal walls with sound deadener, 1/8" minimum thickness. Provide light tight baffle. Reinforce canopy/ceiling construction as required to maintain loads applied during car top inspection.

    a. Provide isolation at connection to plunger using suitable acoustical isolation pads.

    b. At roped hydraulic units connect the sling of the shell to the pit stand by steel hoist ropes which run over the sheave assembly. The ropes shall be of a sufficient number to obtain the factor of safety required by Code.

3. Platform:

    a. Passenger Platforms: Steel frame with steel or wood platform. Undercoat platform with sound-deadening material and fireproofing. Provide 3/4" thick fire retardant treated plywood underlayment over platform surface recessed 3/8” to receive thinset floor finishes.

    b. Service Platforms: Steel frame with steel or wood platform. Undercoat platform with sound-deadening material and fireproofing. Provide 3/4" thick fire retardant treated plywood underlayment over platform surface to receive checkered stainless steel plate floor finish.

4. Guide Rollers: Provide roller guide units to align car and maintain contact of roller wheel with rail. Roller guide units shall consist of 3 or more sound reducing rollers and be held in contact with the guide rail by adjustable devices.

5. Hoisting Ropes and Sheaves (Roped Hydraulic Elevators Only): Provide traction steel hoist ropes of design suitable for the duty of elevators specified herein, fasten with adjustable shackles. Governor ropes shall be traction steel governor rope, suitable for governor furnished, with code required rope guards. Unless otherwise indicated hoist ropes will be dead ended in the pit stand, run up and over the sheave assembly and down to a structural member on the car frame where it again will be dead ended. Provide all sheaves as required including suitable sheet metal guards. Provide all sheaves with sealed sheave bearings.

6. Traveling Cables: Cables of size and number to ensure proper wearing qualities and complying with Code. Furnish adequate compensation for weight of cables when required to maintain proper counterbalance ratio using plastic sheathed chain, or chains (Whisperflex).

7. Buffers: Provide oil buffers complete with all required supports and blocking. Buffers shall have been tested and approved by a qualified testing laboratory substantiating compliance. Provide pipe stand extensions suitable for the depth of the pit, struts, braces, and other supports, as required by project conditions.

8. Pit Switches: An emergency stop switch shall be located in each pit.

9. Normal terminal stopping devices shall be provided. When an emergency terminal stopping device is also required, it shall be furnished and the controller switches and circuitry arranged in accordance with the requirements of the ASME A17.1 Code.

10. Safeties and Governors (Roped Hydraulic Elevators Only): A car safety shall be mounted on the bottom members of each car frame and be operated by a centrifugal speed governor. The governor shall be mounted in the machine room and be designed to cut off power to the motor and apply the brake whenever the governor indicates the car has excessive speed. Safety shall be of the flexible guide clamp type (Type B).

11. Miscellaneous Hoistway Components: Provide sleeves for conduit and other holes, projecting 2" above the floor slab. Provide 2" steel angle guards around cable or duct slots. Provide rope guards for all sheaves and cables. Provide bearing plates, anchors, shelf angles, blocking, etc., to support equipment.

B. Hydraulic Machines And Components: Permanently identify equipment with numerals 4" high corresponding to elevator number.

1. Performance:

a. Speed: +/-5% under any loading condition in up direction; contract speed or faster in down direction.

b. Capacity: Safety lower, stop and hold up to 125% rated load.

c. Leveling: +/-1/4" regardless of load condition and direction of travel. Self leveling shall, within its zone, be entirely automatic and independent of the operating device and shall correct for over travel, and undertravel and rope stretch on roped hydraulic elevators.

d. Door Opening Time: Adjustable 1 to 5 seconds.

e. Floor-to-Floor Time: Measure from start of door closing at one floor to fully open, car level and stopped at next floor; 15 seconds.

f. Noise and Vibration Control: The elevators (including all components such as support equipment, controllers, power units) shall be mechanically isolated from

the structure and electrically isolated from the building power supply and each other to prevent noise and vibration.

g. The plungers and cylinders shall be installed plumb and shall operate freely with minimum friction.

h. Hydraulic Pressure: 400 psi maximum.

2. Hydraulic Plungers - Cylinder Assemblies (For Holeless Hydraulic Units): Provide direct-lift single cylinder, single-acting plunger and cylinder assembly, designed for the load and speed of each elevator. Fabricate hydraulic plunger-cylinder assemblies in accordance with the ASME A17.1 Code and the following:

a Fabricate cylinder of steel pipe. Use external couplings to join multiple section type cylinders. Provide a dished seamless head and safety bulkhead, formed concave to pressure, at the bottom end of the cylinder. Provide the top end of the cylinder with a cylinder head complete with a drip ring, to collect any oil seepage, and an internal guide ring with bronze bearings and self-adjusting packing. Protect exterior of cylinder with a heavy coat of rust-inhibitive paint.

b Fabricate plunger of seamless steel tubing. The plunger shall be machined true and smooth with a fine polished finish. Use pin type internal guides to join multiple section plungers. Electrically weld a stop ring assembly to the bottom end of the plunger to prohibit the plunger from exiting the cylinder. Attach plunger to the car frame using sound isolated platen connections.

3. Hydraulic Pumping Units (For Holeless and Roped Hydraulic Units): Provide self contained, hydraulic elevator pumping units. The pumping unit shall include an electric motor connected to a pump, a hydraulic control system, a storage tank, necessary piping connections, and a controller, all compactly designed and mounted on a structural steel bedplate as a single self contained unit. The tank shall be supported by a structural steel frame. Mount hydraulic pumping unit assembly onto floor or foundation with isolation mounts, designed to eliminate the transfer of vibrations to the building structure.

a. Each motor shall be of the alternating current, reduced current starting, polyphase squirrel cage induction type and shall be of a design especially adapted to electro-hydraulic requirements.

1) Successive Starting: When the motor is shut down due to lack of demand, it shall be allowed to start-up as required to satisfy demand. In the event of power demand or power restoration, the motor shall start up immediately. The motor shall be sized for a minimum of 120 starts per hour.

2) Where more than one motor is used, provide sequenced connected and electrically interlocked motor starters, to prevent simultaneous starting of multiple motors.

b. The pump shall be a positive displacement screw type to give smooth operation and shall be especially designed and manufactured for elevator service.

c. The hydraulic control system shall be of compact design suitable for operation under the required pressures. Provide adjustable control valves (up start valve, up leveling valve, down lowering and down leveling valve) designed for slow opening and closing for controlled acceleration and deceleration and for smooth stopping and starting of car, both for "Up" and "Down" travel. A check valve, relief valve, tank shut off valve, and manual lowering valve shall be included as part of the system. The manual lowering valve shall permit lowering the elevators at slow speed in the event of power failure or for adjusting purposes. Provide "Low Oil Control Feature" which automatically returns the car to lowest level, opens doors and prevents operation of elevators until oil supply has been replenished. Self-cleaning strainers shall be provided to prevent foreign materials lodging in control system.

d. The storage tank shall be constructed of steel, and shall be provided with a cover, a protected vent opening and oil fill, an oil level gauge that clearly indicates the permissible minimum liquid level, a filter screen mounted over the suction inlet and a drain connection. Tank design shall incorporate a reserve capacity of no less than 10 gallons. Provide full supply of hydraulic oil of an oil type as recommended by the manufacturer of the pump and hydraulic system.

4. Electrical Controller Units:

a. Provide micro-processor type control equipment wall or floor mount independent of machine.

b. Enclose controller unit (and separate power panel, if any) with louvered sheet metal doors and panels.

c. Provide devices which cause the car to return to the lowest landing when the car has not been used for an extended time period.

5. Piping: Size, type and weight as required by Code but not less than Schedule 80 steel. Install between the pumping unit and the cylinder head. Where hydraulic lines pass through walls provide a pipe sleeve and isolation seal made from rubber or neoprene. Provide sound-isolating couplings for connection of piping to pumping unit. No pipe shall be over 10 feet in length without support.

a. Provide two manual shut off valves for each elevator, one in the elevator machine room as required by Code for maintenance and adjusting purposes and one in the pit, between the pump unit and the overspeed drive.

b. Provide and overspeed valve, in the supply line, which works on pressure drop and requires no electrical supply for operation, to stop the elevator, in the event of a broken supply line or an abnormally high rate of flow, between the overspeed valve and the power unit.

6. Emergency Return Operation:

a. A car-mounted battery-operated emergency return device shall be provided on e ach car to prevent passengers from being trapped in the elevators in the event of a

power outage condition. In such event each elevator shall automatically return to the bottom floor and provide a door operation, after which each elevator shall be shut down with its doors closed but subject to door operation from within the car.

b. The emergency return power supply unit is to be powered by suitable batteries that are automatically maintained at full charge with the charging voltage regulated. Battery to be sealed gel type with 10 year minimum life expectancy. The unit shall power minimum of two regular ceiling down lights in the elevator.

c. The emergency return device must not permit movement of the elevator if the disconnect switch is in the OFF position per A17.1.

7. Passenger and Service Car Enclosures: All graphics for car enclosures shall be in a type style to be selected by Architect, with minimum size to comply with the applicable codes and as accepted on the shop drawings by Architect.

a Car Enclosure Manufacturer shall be the elevator manufacturer.

b Car Enclosure Doors: Minimum 1" thick, flush type, sound deadened, horizontal sliding, 16 ga. hollow metal doors of stainless steel sheet with #4 finish. Door panels shall be 1-1/2 hr. "B" label construction and so labeled.

c Car Enclosure Door Track and Sheaves: Cold rolled steel track, sheave wheels made of or tired with a suitable sound reducing material which rotate on a grease packed precision ball bearings.

d Car Enclosure Sills: Extruded nickel silver, with grooved surface, not less than 1/4" thickness of metal when measured at ribs, mill finish.

e. Car Enclosure Door Frame and Front Wall: Custom fabricated full width swing clear fronts, fabricated from stainless steel sheet with #4 finish. Provide cut-outs, cabinets and reinforcing for signal equipment.

f. Car Enclosure Side Walls: refer to drawings

h. Car Enclosure Handrails:

1) Passenger Cars: Custom fabricated handrails fabricated from #4 satin finished stainless steel pipe or tube stock to the sizes, shapes and profiles indicated. Mount to car enclosure back and side walls with concealed set screw mounting.

i. Car Enclosure Base: Fabricated from stainless steel with #4 finish integral with car enclosure back and side walls.

j. Car Enclosure Floor Covering:

1) Passenger Cars: Refer to drawings

k. Car Enclosure Ceiling and Lighting:

1) Passenger Cars: Custom fabricated tamper/vandal resistant, ceiling assembly, with #4 satin finished stainless steel framing supporting flourescent strip light fixtures mounted above perforated #4 satin finished stainless steel panels as required to provide an average car lighting level of 30 ft-candles. Provide ceiling and top of car access of size and location as required by code.

l. Car Enclosure Emergency Lighting: Provide emergency lighting from car mounted rechargeable battery unit.

m. Car Enclosure Mechanical Ventilation: Rheostatic controlled squirrel cage exhaust blower and capable of delivering required cfm and arranged for 2-speed operation; sound isolate and mount to exhaust blower plenum on canopy.

n. Car Enclosure Certificate Notice: Engrave CERTIFICATE ON FILE IN JETPORT OFFICE message on a separate insert which, when installed, will fit flush with car front return panels and which is removable from inside the car. Locate notice above control panel to front return face.

8. Hoistway Entrances: Hoistway entrances shall be fabricated in accordance with the drawings, and conform to the regulations of ASME A17.1. Provide all hoistway entrances including hollow metal frames, hollow metal doors, sills, struts, closer angles and hanger supports; hanger cover plates, extended fascia plates, toe guards, dust cover and landing sill guards; tracks; headers; sheaves, hangers and hardware. Provide sight guards for all openings formed of 16 ga. metal matching material and finish of door panel. Provide painted numerals on door non-vision wing, each floor, each entrance. Hoistway entrances shall be of UL 1-1/2 hour, NFPA 80 fire test, construction and be so labeled as required to meet ASME A17.1 requirements.

a. Hoistway Entrance Door Panels: Minimum 1-1/4" thick, flush type, sound deadened, horizontal sliding of minimum 16 ga hollow metal construction, with 2 gibs per panel. Make provisions to prevent rattling.

1) Hoistway entrance door panels shall be #4 satin finished stainless steel.

b. Hoistway Entrance Door, and Frame, Track and Sheaves: Cold rolled steel track, sheave wheels made of or tired with a suitable sound reducing material which rotate on a grease packed precision ball bearings.

c. Hoistway Entrance Frames: 14 ga hollow metal construction, sound deadening coating on concealed surfaces, prepared for hardware, anchorage, signal equipment and accessories. Hoistway entrance frames shall be #4 satin finished stainless steel. Frames shall be installed with bolt fastenings to sill brackets and headers and returned to hoistway side to present a neat appearance.

1) Corners: Fabricate corners of mitered-welded-ground smooth construction.

d. Hoistway Entrance Sills: One piece extruded nickel silver, with grooved surface, not less than 1/4" thickness of metal when measured at ribs, mill finish.

9. Door Operators:

a. Power Door Operators: Manufacturer's standard high speed, heavy duty, DC master type, door operator unit with checking action at both limits of travel. Provide on the car, arranged to operate car door and hoistway entrance simultaneously at a maximum speed of approximately 2-1/2 feet per second. Provide separate and adjustable timers to establish minimum passenger transfer time for car stops and hall stops.

b. Door Edge Protection Device: Equip leading edges of doors with a protective device extending full height. Provide device which will reopen door for an adjustable period of time, when making contact with an object while doors are closing but not fully closed.

c. Door Detector Device:

1) Equip leading edges of doors with a concealed infrared screen type detector device capable of detecting the presence of an object in the process of passing through the hoistway entrance and car doorway, without the door edges or devices actually making contact with the object. Arrange detector system to prevent the doors from closing or, if they have already started closing, to reopen only far enough to permit passenger to pass and continue to close as soon as passenger clears the zone of detection to substantially reduce the interval and increase the handling capability. The zone of detection shall project in front of car and hoistway doors.

2) Equip detector system with an adjustable anti-delay device which will proceed to close the doors at reduced speed after a 15-sec operation of the detector (beyond normal door-open period) and simultaneously actuate a loud buzzer located in the car. A keyed switch shall be provided in the car station to cut out the detector device, if it should fail, permitting operation of the elevators. If the detector device fails, the doors will not close until released by operating the keyed switch or by the nudging action. The protective device on each car door shall remain operative.

d. Door Interlocks: Each hoistway entrance shall be equipped with an interlock complying with ASME A17.1. The interlock shall prevent operation of the car away from the landing until the doors are locked in the closed position as defined by the code and shall prevent opening the doors at any landing from the corridor side unless the car is at rest at the landing or is in the leveling zone and stopping at that landing.

10. Operations And Devices:

a. Automatic Operation: The starting and stopping of the car occurs in response to hall and car signal buttons, programmed operating devices, and safety devices. Power-operated doors operate automatically in response to calls and car

movement. Car movement is possible only when hoistway door interlocks and car door switch circuits are complete.

b. Hoistway access switches, conforming to the requirements of ASME A17.1, shall be provided for all elevators to permit authorized persons to gain access to hoistway when each elevator is away from the landing. Mount without faceplates in entrance door as required by Code.

c. 2 Stop Collective:

1) General: Operate elevator from single button hall call stations and operating buttons in car.

2) Operation: Hall call button or car button causes car to start and proceed to that floor. Doors shall open automatically when car arrives. When car is traveling away from a registered landing call, call remains registered and car responds on next trip.

d. Duplex, Selective Collective Operation:

1) General: Operate elevator from hall call buttons and operating buttons in car. When cars are available, park car at main floor ("home" car). Park other car where last used ("free" car).

2) Operation:

a) Respond to car calls and hall calls above the main floor using "free" car. Once a car has been started respond to registered calls in the direction of travel and in the order the floors are reached.

b) Do not reverse car direction until all car calls have been answered, or until all hall calls ahead of the car and corresponding to the direction of car travel have been answered.

c) Slow cars and stop automatically at floors corresponding to registered calls in the order in which they are approached in each direction of travel. As slow down is initiated, automatically cancel hall call. Cancel car calls in the same manner. Hold car at arrival floor an adjustable time interval to allow passenger transfer.

d) Answer calls corresponding to direction in which car is traveling unless call in the opposite direction is the highest (or lowest) call registered.

e) When the "free" car" is clearing calls, start "home" car to respond to:

i) A call registered on "home" car pushbuttons.

ii) An up hall call registered below "free" car.

iii) An up or down call registered above “free” car while “free” car is traveling down.

iv) A hall call when “free” car is delayed in its normal operation for a predetermined period.

f) When both cars are clearing calls, stop only one car in response to any registered hall call. Return the first car to clear its calls to main floor. Should last service required bring both cars to main floor, the first arriving car becomes the free car.

e. Automatic Group Operation: Elevators shall operate without attendants as a group and be capable of balancing service and continuing operation with one or more cars removed from the system. Control of elevators shall be automatic in operation by means of push buttons in the car, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings. The microprocessor in the controller shall constantly scan the system for all calls. When calls are registered, the control system shall instantly calculate the estimated time of arrival for each car in the system, number of floors to travel from the current position of each car in the system, calls assigned to each car, and car reversal time to respond to a call in the opposite direction of travel. Only one car shall respond to any particular hall call. When a car's status changes or additional hall calls are registered, the estimated time of arrival shall be recalculated and calls reassigned to another available car, if necessary.

1) Traffic Pattern: The microprocessor shall be easily reprogrammable and have the flexibility to meet well defined patterns of traffic, including up peak, down peak, and heavy interfloor demands, and adjust for indeterminate variations in these patterns which occur in buildings.

2) Momentary pressing of one or more hall buttons shall dispatch a car to the designated landing(s) in the order in which the landings are reached by the car, irrespective of the sequence in which the buttons are pressed. Each landing call shall be cancelled when answered.

f. Auxiliary Operations:

1) Manual Door Controls: Car station buttons for "door open" and "door close".

2) Inspection (Top of Car) Operation: A key switch shall be provided in the car to permit operation of the elevator for inspection purposes from on top of the car. An operating fixture shall be located on top of the car to permit inspection operation from that location and shall contain continuous pressure buttons for operating the car, an emergency stop button and a permissive toggle switch.

3) Start-Up Phasing: Delay interval between successive start-up of machines or pumping units.

4) Emergency Power: Provide automatic switch to built-in battery power during power failure to lower car to ground floor and open doors. Provide automatic switch(es) to emergency power generator during power failure to control Elevator Nos. 3 and 6 Only.

5) Loaded Car By-Pass: Provide a load weighing device at each car which, when the particular car is filled to an adjustable percentage of the capacity load, shall cause the car to bypass landing calls but not car calls. The passed landing calls shall remain registered for the next following car. The bypass switch shall not disable the door reopening devices unless the door closing kinetic energy is reduced to 2.5 ft-lbs per A17.1.

6) Smoke Detection Recall: When the elevator vertical travel is 25 feet or more, each associated elevator lobby area and the elevator machine room shall be provided with an approved, listed smoke detector for elevator recall purposes only. When the lobby area smoke detector, or machine room smoke detector, is activated, the elevator doors shall be prevented from opening and the car serving that lobby area, or served by equipment in the machine room, shall return to the Concourse level where it shall be under manual control only. If the Concourse level lobby area smoke detector is activated, the car shall return to a location approved by the chief of the fire department and building official where they shall be on manual control only.

7) Independent Operation: Key-activated removal from group service; car responds only to car calls.

8) Firemen's Emergency Service: Equip the elevators with a control system to operate and recall the cars during fire or other emergency condition per code. Connect signal from sensors provided in other sections of the work to the interconnection wiring terminal box in the elevator machine room. Operation shall be similar on all elevators and visual/audible signal shall operate until return is complete or automatic operation restored.

   i) Designated Floors: Primary return shall be to the lowest level. Secondary return shall be to the Concourse Level unless otherwise directed by the Fire Marshal.

   ii) Provide Code required three position key switch for Phase I Emergency Recall Operation at the lowest level for all elevators. Unless otherwise shown or directed by the Fire Marshall the keyed switch shall be located in the hall call station. When the switch is in the "ON" position, all elevators in a group, which are in normal service shall return non-stop to the lowest level, and the doors shall open.

   iii) Provide Code required three position key switch for Phase II Emergency In Car Operation in the control panel of each elevator car. The switch, when operated, shall put the elevator on Phase II emergency services. The key shall be the same as required for the

lowest level operation but shall be different from all other elevator keys. Fireman's service Phase II operation shall override all floor lockout means.

iv) Key required to call or operate elevators as described shall be kept in a metal key box mounted in the lowest level lobby as approved by the Fire Marshall. The box shall have a lock type cover which can be opened by the Fire Department's alarm box key.

9) Anti-Nuisance Call Control: The microprocessor control system shall evaluate the number of people on the car and compare that value to the number of car calls registered. If the number of car calls exceeds the number of people by a field programmable value, the car calls shall be canceled after the first call has been answered.

h. Automatic Leveling Device: Provide on each car, adjustable automatic leveling device, which will position car within 1/4" of each landing level regardless of travel direction or size of load. Landing level will be maintained within the leveling zone irrespective of the hoistway doors being open or closed.

i. A protective circuit shall be provided which will stop the motor and the pump in the event the car does not reach its designated landing within a predetermined time interval. This circuit will permit a normal exit from the car but prevent further operation of the elevator until the trouble has been corrected.

j. Security System: System to provide all controls, relays and wiring modifications necessary to interface with Jetport's's car-operated security system from a single card reader located in either the elevator control panels or hall call stations to the extent indicated in the Elevator Schedule.

1) Provide 24 volt relay-controlled switch to convert the operation of the system to operate using magnetic cards (common to entire Building security system). This changeover switch will be operated by Building security system. When in this mode, the car will only proceed to the floor authorized by the card. The cars will answer hall calls from every floor, but will only take the car to the concourse lobby level.

2) Card readers for after hour security access will be furnished by Division 27.

3) Provide required conductors in machine room for interconnecting card readers, other security access system equipment, and elevator controllers.

4) Arrange system so that emergency controls override security system.

11. Signal Equipment: Where ever graphics are required for signal equipment they shall be provided in the minimum code required size, and in a type face, as accepted by the Architect on the shop drawings.

a. Hall Signal Equipment:

1) Hall Push-Button Station: Provide push button stations with #4 finished stainless steel coverplates and with engraved black lacquer filled symbols per ADA. Provide one station per landing. Each push button shall either have an illuminating trim ring or illuminate when pushed. The push button trim ring, or button, shall illuminate when pressed and when task is accomplished the push button trim ring, or button, shall extinguish.

   i) Lowest Level Stations: Provide custom recessed hall push button stations with concealed attachment to wall substrates. Provide custom recessed key operated Firefighter=s Phase I Emergency Recall Operation switch stations with concealed attachment to wall at locations indicated.

   ii) Typical Floor Level Stations: Provide custom recessed hall push button stations with concealed attachment to wall substrates.

   iii) Provide each floor station with pictograph over push buttons indicating in engraved black lacquer filled letters, symbols, and Braille the warning message required by Code.

2) Hall lanterns: Provide a visible and audible signal at each hoistway entrance to indicate when car is answering a call. Audible signals shall sound once for the up direction and twice for the down direction or shall have verbal annunciators that say "up" or "down". Visible signals shall have the following features:

   i) Hall lantern fixtures shall be mounted so that their centerline is at least 72 in. above the lobby floor.

   ii) Provide single lantern at terminal floors.

   iii) Provide pairs of lanterns at intermediate floors.

   iv) Visual elements shall be at least 2-1/2" in. in the smallest dimension. Provide white lensed direction signals illuminating white for up and red for down. Provide satin finished #4 stainless steel mounting plates for drywall opening to the extent detailed.

   v) Signals shall be visible from the vicinity of the hall call button.

3) Hall elevator jamb floor identification: Provide stainless steel #4 finished raised letters and braille located 60" o.c. above finished floor to identify floor location for the disabled. Designations shall be permanently attached on contrasting background and 2-1/2" high.

4) Provide #4 finished stainless steel plate with pictograph over hall button fixtures indicating in raised letters, symbols, and Braille "IN CASE OF FIRE, DO NOT USE ELEVATORS. USE STAIRS TO EXIT". Install stainless steel plate with concealed mounting.

b. Car Signal Equipment: All car signal equipment shall be manufacturers standard with #4 finished stainless steel mounting plates.

1) Car-Position Indicator: Digital display type, located integral with each car control station, showing landing nearest car position and illuminated arrows for car travel direction.

2) Car Control Stations: Provide call button for each landing served, illuminated direction indicator, and other push buttons and keyed switches required for operations and control of required devices and equipment. Provide identification of each signal and control. Each push button in the car control stations shall either have an illuminating trim ring or illuminate when pushed. The push button trim ring, or button, shall illuminate when pressed and when task is accomplished the push button trim ring, or button, shall extinguish. Next to each row of buttons provide individual raised graphics with height as shown, or if not shown, as required to suit ADA requirements. All raised graphics shall have concealed attachment to car panels. Letters shall be removable from rear of panel door.

3) Telephones:

i) Emergency Telephone: Provide one hands-free audio and visual 2-way emergency communication in each car to communicate between the car and a 24-hour monitoring service. System automatically dials preprogrammed number of monitoring service and identifies elevator location to monitoring service. System is contained in flush-mounted cabinet complete with identification, instructions for use, and battery back-up power supply, and complies with ADA regulations.

ii) Fireman's Telephone: Provide a two way fire department communication system (telephone) which shall operate between the fire alarm panel and every elevator car. System is contained in flush-mounted cabinet complete with identification, instructions for use, and battery back-up power supply.

4) Emergency Stop and Alarm System: Provide an emergency stop/signal button at each car control station connected to an alarm bell audible outside the hoistway, which shall be arranged to interrupt the power circuit and stop the car at any point in its travel. Opening of this switch shall not cancel registered calls and when the switch is closed, the car will continue to answer calls that have been registered.

12. Remote Monitoring: Provide an interactive monitoring and diagnostic system tied to each individual elevator, escalator, and moving walk ready for connection to the new building management system (BMS). The BMS shall be centrally located in the BMS Control Room.

a. Lift-Net ; Integrated Display Systems, Inc.

PART 3- EXECUTION

1.1 INSTALLATION

A. Excavation for Jack: Drill excavation in each elevator pit to accommodate installation of cylinders; comply with applicable requirements in Division 31 Section "Earthwork."

1. Provide waterproof well casings to retain walls of well hole.

B. Install cylinders in protective casings within well holes or casings after removing water and debris and providing a permanent waterproof seal at bottom of well casing.

1. Align cylinders and fill space between well casing and protective casing with fine sand.

C. Install cylinders plumb and accurately centered for elevator car position and travel. Anchor securely in place, supported at pit floor. Seal between well casing, protective casing, or cylinder and pit floor with 4 inches of nonshrink, nonmetallic grout.

D. Leveling Tolerance: 1/4 inch (6.4 mm), up or down, regardless of load and direction of travel.

E. Set sills flush with finished floor surface at landing. Fill space under sill solidly with nonshrink, nonmetallic grout.

1.2 FIELD QUALITY CONTROL

A. Acceptance Testing: On completion of elevator installation and before permitting use (either temporary or permanent) of elevators, perform acceptance tests as required and recommended by ASME A17.1 and by governing regulations and agencies.

1.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain elevators. Review emergency provisions and train Owner's personnel in procedures to follow in identifying sources of operational failures or malfunctions. Refer to Division 01 Section "Closeout Procedures."

1.4 PROTECTION

A. Temporary Use: Do not use elevators for construction purposes unless cars are provided with temporary enclosures, either within finished cars or in place of finished cars, to protect finishes from damage.

1. Provide full maintenance service by skilled, competent employees of elevator Installer for elevators used for construction purposes.

1.5 ELEVATOR SCHEDULE

A. Elevator No. 4 and 5 (Ticketing to Security Screening)

1. Type: Under-the-car single cylinder.
2. Rated Load: 5000 lb (2270 kg).
3. Rated Speed: 100 fpm (0.5 m/s).
4. Operation System: Group automatic operation.
5. Auxiliary Operations:

    a. Standby powered lowering.
    b. Independent service.
    c. Loaded-car bypass.
    d. Automatic dispatching of loaded car.
    e. Nuisance call cancel.

6. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with satin stainless-steel frame.

B. Elevator No. 6 and 7 (Security Screening to Hold Rooms)

1. Type: Holeless, roped hydraulic, dual cylinder.
2. Rated Load: 5000 lb (2270 kg).
3. Rated Speed: 100 fpm (0.5 m/s) .
4. Operation System: Group automatic operation.
5. Auxiliary Operations:

    a. Standby powered lowering.
    b. Independent service.
    c. Loaded-car bypass.
    d. Automatic dispatching of loaded car.
    e. Nuisance call cancel.

6. Additional Requirements:

    a. Provide inspection certificate in each car, mounted under acrylic cover with satin stainless-steel frame.

END OF SECTION 14 24 00

SECTION 14 31 00 - ESCALATORS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes heavy-duty escalators, all cleated step reversible type for passenger service.

1. BMS components will be incorporated into the heavy duty escalator work. Coordinate with the BMS component contractors to incorporate BMS components during the course of the Work.

B. Single Subcontract Responsibilities: Refer to Section 14 20 00 VERTICAL TRANSPORTATION, GENERAL for the requirements of single subcontract responsibilities for escalators.

1.2 DEFINITIONS

A. Heavy-Duty Escalators: Escalators designed specifically for use where high-traffic volumes produce dense occupancy and structural, machinery, and brake loads are much higher than normal.

B. Defective Escalator Work: Operation or control system failures; performances below specified ratings; excessive wear; unusual deterioration or aging of materials or finishes; unsafe conditions; the need for excessive maintenance; abnormal noise or vibration; and similar unusual, unexpected, and unsatisfactory conditions.

1.3 PERFORMANCE REQUIREMENTS

A. Operational Requirements: The escalator systems shall:

1. Be capable of operating under full load conditions, at full contract speed, in either direction, and designed to operate quietly and smoothly without bounce.

2. Have a rated speed not exceeding 100 ft./min. (0.51 m/s). The no load to full load speed shall not exceed 4% of the advertised speed.

3. Hours of operation shall be considered as twenty-four (24) hours per day, seven (7) days per week.

4. Direction of travel shall be considered as either direction, and unit shall be up and down reversible.

B. Structural Requirements: Contractor shall provide escalator trusses, truss mounting angles and intermediate truss supports with attachments, sized as required to install escalators into wellway structural supports indicated.

C. Environmental Requirements: Escalators shall be capable of operating with full-specified performance capability while exposed to the design climatic and environmental conditions: Climatic and environmental design conditions are available from the mechanical engineer.

D. Structural Performance of Balustrades: Per ASME A17.1-1996, as Supplemented by ASME A17.1a-1997 provide balustrades designed to resist the simultaneous application of a static lateral force of 40 lbf/ft and a vertical load of 50 lbf/ft, both applied at the top of the handrail stand.

E. Each escalator shall be of a 48 inch nominal width measured 27 inches above front edge of tread, have a 40 inch step width, and be designed for an maximum incline of 30 degrees from the horizontal.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

B. Installer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

C. Professional Engineer Qualifications: Professional Engineer Qualifications: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

D. Standards: The following standards shall govern the escalator work. Where standards conflict, the standard with the more stringent requirements shall be applicable.

1. Escalator Code: In addition to requirements of authorities having jurisdiction, comply with the latest edition of ASME A17.1, "Safety Code for Elevators and Escalators", ASME A17.2.3 “Inspectors Manual for Escalators and Moving Walks”, and ASME A17.5 “Requirements for Elevator and Escalator Electrical Equipment”, including supplements, as published by the American Society of Mechanical Engineers. Wherever “Code” is referred to in the escalator specification, the ASME A17.1 Code shall be implied.

2. Electrical Code: For electrical work included in the escalator work, comply with the National Electric Code (NFPA 70), all applicable local codes, and the authorities having jurisdiction.

3. Welding: Comply with AWS standards.

4. Americans with Disabilities Act (ADA).

5. International Building Code, 2003 ed.

E. Electrical Devices and Equipment: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

F. Manufacturer: Provide all escalator components from a single source. Where equipment or operation varies from those described, the manufacturer shall provide a complete description of

those variations as required under Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL, Article QUALITY ASSURANCE, paragraph 'Contractor Statement'.

G. Testing and Inspections: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.5 SUBMITTALS

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

B. Warranty and Maintenance Agreement: Warranties and maintenance agreements are required, refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

C. Maintenance and Operating Manuals: Maintenance and operating manuals are required, refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

D. Shop Drawings: Submit complete information for all components for review prior to the fabrication of the escalator work. Items which shall be detailed shall include the following:

1. Fully dimensioned layout for escalators in plan, elevation, and section at a scale of ¼" = 1'-0". Indicate component locations, structural supports, access spaces, and points of entry. Indicate the interface of the escalator work with adjacent work, including but not limited to, the following:

   a. Fully concealed sprinkler head devices located at the exposed escalator soffit panels.

   b. Recessed light fixtures located at the exposed escalator soffit panels.

   c. Finished flooring surrounding landing plates.

2. Load assumptions for maximum loads imposed on trusses requiring load transfer to building structural framing, individual weight of principal components and their dead and live load reactions at points of support, electrical characteristics and connection requirements, and any other information requested by the Architect.

   a. Structural Calculations: Submit, for information only, copies of structural calculations indicating load assumptions. Calculations shall be signed, and sealed by the qualified Professional Engineer responsible for their preparation.

3. Step linkage details for material, configuration, arrangement, and lubrication requirements.

4. Drive motor, controller, safety devices, and switches including brakes.

5. Complete layout of electrical system including motor, control panel; disconnect switches; panelboards, truss lighting, light fixtures and light switches; receptacles; and safety, surveillance and control devices.

6. Complete single line wiring diagrams of all circuits in the escalator systems. Show component location within each system, terminals with numbers, connection between components, conductor identification, interface connections with remote surveillance and control system, include an explanation of basic operation.

7. Provide a record set of drawings with all changes made during the installation of the work. At the completion of the job, submit to the Owner for the Owner's use a complete set of "AS INSTALLED" plans and wiring diagrams.

E. Product Data: Submit manufacturers design data, material specifications, installation instructions, and other data pertinent to the components used in the escalator work.

1. Provide the Owner with special tools, solid state microprocessor tools, including appropriate programs relative to the specific type of microprocessor or computer controls installed on this project, necessary to trouble shoot, service, test and maintain the escalators. Special tools become the property of the Owner. Tools provided shall be useable throughout the life of the equipment.

a. Tools may be hand held or built into the control system and may be factory programmed to operate only with this project’s equipment.

F. Samples: Submit samples as follows:

1. For exposed finishes, 3-inch- (75-mm-) square samples of sheet materials, and 4-inch (100-mm) lengths of running trim members. Acceptable low and high range of variation in color and finish shall be governed by the control samples in the Architect's office.

G. Certificates and Permits: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.6 JOB CONDITIONS

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

PART 2 - PRODUCTS

2.1 Basis of Design Manufacturer: NCE ESCAL-AIRE escalators by Otis Elevator Company.

2.2 MATERIALS

A. Structural Steel:

1. Rolled Steel Sections, Shapes and Rods: ASTM A36.

2. Tubing:

   a. Cold Formed: ASTM A500.

   b. Hot Formed: ASTM A501.

3. Sheet Steel: ASTM A446, grade B, zinc coated.

B. Stainless Steel:

1. Sheet, Plate and Strip: ASTM A 666 or ASTM A240, Type 304.

2. Shapes and Bars: ASTM A276, Type 304.

3. Finish: No. 4 satin finish. Brush marks shall run parallel with the escalator travel.

C. Aluminum Castings and Extrusions:

1. Castings: ASTM B108 alloy and temper as required to meet the strength and performance requirements.

2. Extruded Aluminum: ASTM B221, Alloy 6061 or 6063, T6.

3. Finish: Commercial mill finish.

D. Enameled Steel: ASTM A 366/A 366M, cold-rolled commercial steel, matte finish, stretcher leveled. Provide with factory-applied enamel finish; colors as selected by Architect.

E. Clear Tempered Glass: ASTM C 1048, Condition A (uncoated surfaces), Type 1 (transparent glass, flat), Class 1 (clear), Quality q3 (glazing, select), Kind FT (fully tempered).

F. Fasteners: Provide bolts, nuts, washers, screws, rivets, and other fasteners necessary for the proper erection and assembly of the escalator work. Fasteners shall be compatible with materials being fastened.

G. Welding Materials: Comply with AWS D1.1.

H. Sealants, Joint Fillers and Primers: Sealants, joint fillers and primers internal to the escalator systems shall be as selected by the escalator manufacturer. Perimeter sealants, joint fillers and primers are specified under Section 07 92 00, JOINT SEALANTS.

I. Paint and Corrosion Protection: Each escalator shall have the following minimum corrosion protection.

1. Cast metal parts such as gear housings, chain sprockets and return station half circles, shall be painted with a rust inhibitive primer coat after preparation by sandblasting.

2. Steel parts which are not specified to be galvanized shall be painted as follows:

   a. Primer coat two (2) mil (dry film thickness), minimum thickness.

b. Second finish coat two (2) mil (dry film thickness), minimum thickness.

3. Bright or uncoated axles, shafts, etc. Shall be protected by zinc chromate, or chrome plating.

4. Oil drip pans shall be fabricated of carbon steel and factory primed.

2.3 COMPONENTS

A. General: Provide heavy-duty escalators complying with requirements. Each escalator shall be a self-contained unit consisting of truss, tracks, step drive units, steps, step chains, comb plates, handrails, driving machine, controller, safety device, balustrades, panels, and all other parts required to provide a complete operating escalator.

B. Trusses: The escalator trusses shall be fabricated of welded structural steel components and be designed and constructed so as to safely carry the entire load of each escalator, including all parts of same together with the full capacity load and including the weight of the exterior balustrade and truss and soffit panel coverings as indicated. The top end of the trusses shall be arranged to carry the drive machine. Provide a machinery space covered with removable landing plates all within the outline of the trusses. The trusses shall have a factor of safety in accordance with the requirements of the ASME Code. The trusses shall come in sections in sizes that can be installed without disturbing the building structure as detailed.

1. Each truss shall rest on and be firmly secured to top and bottom supporting framing members provided in the wellway structure. Trusses shall be ample strength to rigidly maintain the alignment of tracks and moving parts and shall be so designed that they will safely retain the steps and running gear, and in the case of a failure of the track system, retain the step mechanism within the guides and the envelope of the individual truss. Intermediate supports shall be of the stub column and beam type bolted or welded to the wellway structure. All truss mounts, including bolts, angles, shims, bearing pads, and spring supports shall be provided and installed for a complete installation.

2. Provide isolation, designed of rubber and steel, at all escalator support locations.

C. Oil Drip Pans: Provide factory primed, 3mm thick, steel drip pans under full width and length of escalator trusses to collect and hold oil and grease drippings from lubricated components. Design and fabricate drip pan to sustain a load of 250 lbf (1.1 kN) on a 1.0-sq. ft. (0.9-sq. m) area at any location.

1. Drip pans shall be of a sufficient size to collect and maintain, within the truss area, all oil, water and grease droppings from the step linkage and all forms of loose debris that may be deposited in the drip pans from the steps in the turn around point at the lower and upper portions of the truss. An access shall be provided to the drip pans at the lower landings of all escalators for cleaning the drain catch basin. The drip pans in the upper landings of escalator wellways shall be removable for cleaning, or otherwise be accessible for easy cleaning.

D. Balustrades: Profile as indicated and arranged with moving handrails on guide rail that is supported by 12 mm thick clear tempered glass panels without mullions between panels, with stainless steel deck covers, skirts, trim, and accessories.

1. Handrails:

    a. The handrail drive shall be of the traction type and provided with tension device. The handrails shall receive their motion from the main drive of each escalator and shall be so connected to the escalator that the handrail will operate at the same speed and in the same direction as the escalator steps.

    b. All handrail rollers shall be provided with sealed ball or roller bearings rated at L10, 100,000 hours and have provision for retention of lubricant to ensure satisfactory lubrication and operation. The color of handrails shall be black.

    c. Friction drive sheaves and idlers shall be designed and positioned so that lubricant cannot reach surface of handrail. Marking and spotting of handrail by drive equipment shall not be permitted. Provide sealed bearings rated at L10, 100,000 hours.

    d. The handrails shall be constructed of laminated, steel, wire mesh, or steel cable reinforced, flexible elastomer material vulcanized into an integral, seamless, smooth handrail resistant to environmental conditions. Each handrail shall operate on formed guides except when in contact with the driving sheaves. A specially coated finish to minimize frictional wear on the underside of the handrail shall be provided. The formed guides shall be fabricated from a material not subject to corrosion or pitting and having a polished or specially coated permanent finish to minimize the frictional wear on the under surface of the handrail.

    e. The handrail rollers and guides shall be so arranged that the handrail cannot be easily thrown off or disengaged while running. Handrails shall be provided with substantially square edges at points of contact with the balustrading.

    f. The extending newels shall be so designed and built that the handrails will disappear into the balustrading at a point difficult to reach.

2. Deck Covers, Skirts, and Trim: Minimum 3 mm thick, satin stainless steel with clear Teflon coating at skirt panels. Skirts shall be fastened to the truss with hidden fastenings. Skirt panels shall be installed without overlapping joints or requiring trim pieces to cover where two skirt panels meet. Inner decks shall attach to the upper edge of the skirt and shall extend to the glass inner surface. The inner deck shall be attached to the skirt with oval head stainless steel screws. Outer decks shall be attached with concealed fasteners and shall extend outward from the outer glass surface with a turn down at the finished width and either capture the adjacent wall finish or be concealed behind it as accepted on the shop drawings.

    a. The clearance to either side of the steps between the steps and the adjacent skirt guard shall be not more than 3/16”, and the sum of the clearances on both sides shall be not more than ¼” per RS-18, Section 802.3e.

3. During construction, exposed metal finishes shall be protected as recommended by the escalator manufacturer. Upon completion of the balustrades, the exposed work shall be cleaned and polished.

E. Guards at Ceiling and Soffit Intersections: Minimum ¾" thick clear lexan plastic, with exposed edge rounded.

F. Truss Panel Cladding: Minimum 3 mm thick, bake enameled carbon steel. Cladding panels shall be constructed, when practical, in equal lengths for interchangeability. Cladding panels shall be attached to permit easy removal for inspection, lubrication, and adjustment of safety devices. Cladding panels shall be sized so that not more than two (2) persons shall be required to remove a panel, and without the aid of special handling equipment. Cladding panels shall be secured with concealed fastening systems. When framework to which cladding panels are fastened is less than one quarter (1/4) of an inch thick, steel backup plates with a minimum one quarter (1/4) of an inch thickness shall be added which have tapped holes or clearance holes where necessary. Provide sound deadening to back of cladding panels.

G. Decking Panels: Minimum 2 mm thick, satin stainless steel. Decking panels shall be constructed, when practical, in equal lengths for interchangeability. Decking panels shall be attached to permit easy removal for inspection, lubrication, and adjustment of safety devices. Decking panels shall be sized so that not more than two (2) persons shall be required to remove a panel, and without the aid of special handling equipment. Decking panels shall be secured with concealed fastening systems. When framework to which decking panels are fastened is less than one quarter (1/4) of an inch thick, steel backup plates with a minimum one quarter (1/4) of an inch thickness shall be added which have tapped holes or clearance holes where necessary. Provide sound deadening to back of decking panels.

1. Provide antislide devices fabricated of satin stainless steel at decking surfaces.

2. Decking between escalators shall be designed to support a live load of one hundred and seventy-five (175) pounds per square foot or a deflection of greater than 1/200 of the span, without permanent deformation.

H. Escalator Soffit Panels: Minimum 2 mm thick, enameled steel. Soffit panels shall be constructed, when practical, in equal lengths for interchangeability. Soffit panels shall be attached to permit easy removal for inspection, lubrication, and adjustment of safety devices. Soffit panels shall be sized so that not more than two (2) persons shall be required to remove a panel, and without the aid of special handling equipment. Soffit panels shall be secured with concealed fastening systems. When framework to which soffit panels are fastened is less than one quarter (1/4) of an inch thick, steel backup plates with a minimum one quarter (1/4) of an inch thickness shall be added which have tapped holes or clearance holes where necessary. Soffit panel shall be stiffened to prevent sag in excess of 1/360 of the span or 1/8" which ever is more stringent. Provide sound deadening to back of escalator soffit panels.

I. Comb Plates: Fabricate comb plate assemblies from wear resisting, non-corrosive metal material, with exposed anti slip surfaces. Plastic comb plates will not be acceptable. Provide comb plate sections at top and bottom landings and meeting the following requirements:

1. Removable to permit ease of replacement.

2. Yellow in color for safety/demarcation.

3. Have not less than three (3), nor more than seven (7), comb plate sections per comb plate assembly.

4. Provisions for lateral and vertical fine adjustments shall be provided so that cleats of step treads pass between comb teeth with minimum clearances.

5. Comb teeth shall be designed so as to withstand a load of two hundred and fifty (250) pounds applied in an upward direction at the tip of any one (1) tooth.

J. Step Treads: One-piece, unpainted, die-cast aluminum with demarcation grooves at front and rear of tread surface. The step treads shall be cleat type, designed to insure a secure foothold and comfortable tread surface; the cleats shall be fabricated to meet code requirements.

1. Cleats shall be so spaced that the ends are flush with the side of the steps. The tread surface shall be adjacent to adjustable skirt guards on each side of the step and the overall width of the step shall be machined to accurate limits to maintain a minimum clearance between the skirt guards and the step.

2. Step Side Demarcation: Yellow 1" wide stripe at sides of step treads.

3. Back of Step Demarcation: 2-inch- (50-mm-) wide yellow stripe at back of step treads.

4. Steps and their various attachments shall permit removal of steps without disturbing balustrades or dismantling any part of the chains.

5. The design shall permit the running of the drive without steps for convenience in cleaning and inspection.

6. Step Rollers: Step rollers shall have polyurethane tires on a sealed hub and bearing and be manufactured for quiet operation. Step bearings shall be of the ball or roller type, be factory sealed, and a diameter of no less than three (3) inches. Step rollers shall not require any additional lubrication and must be rated for severe, heavy-duty service. Step rollers shall be mounted so as to prevent tilting and rocking of the steps.

7. Steps shall be constructed so as to be driven by step linkages to step or step rollers.

8. Washers and nuts shall be provided as follows:

   a. Tap bolts: Lock washers.

   b. Through bolts: Lock nuts.

9. Vertical curved step risers shall be furnished with vertical cleats arranged to pass between the cleats of the tread on the adjacent step to form an intermeshing unit.

10. Rated Loads:

    a. In addition to the minimum requirements given in the Codes, Contractor shall design the Steps for a minimum load of six hundred and fifty (650) lbs. (1430 Kg) per forty (40) Inch step with a safety factor of eight (8).

    b. The steps shall carry the load under maximum concentric and eccentric loading conditions without distortion.

11. Number: Provide escalators with flat steps at top and bottom landings as follows:

    a. For escalators having a vertical rise of up to 30 feet nominal provide 3 flat steps.

    b. The number of flat steps specified shall be measured from the point where the comb teeth join the comb plate in a horizontal direction to the first exposure of the riser of an adjacent step at the upper and lower landings.

K. Landing Floor Plates and Frames: Landing floor plates shall be provided to cover the full width of the truss at each end, extending from the comb plate and the floor line of the balustrade, to the end of the truss. Exposed portions of the landing floor plates shall be of finish metal matching step and comb plate. Plates shall be die cast aluminum in a ribbed pattern transverse to the escalator axis. Ribs shall be designed to provide maximum traction, and shall be finished in the same manner as the comb plates. Landing plates shall be removable. Plates shall be reinforced, as necessary, to be rigid and able to withstand a live load of two hundred and fifty (250) pounds per square foot with zero permanent deformation. Landing plates shall be installed flush with the elevation of the finished floor. Provide a frame around the floor openings to receive the landing floor plates fabricated from metal matching the plates. The upper edge of the frames shall be flush with the elevation of the finished floor.

1. In cases where two escalators are installed side by side, landing plates shall be designed to allow the adjacent escalator to remain operational while work is being performed on the in-operable escalator.

L. Step Chains:

1. Chain shall be endless, roller type step chains specifically designed for escalator application; one (1) on each side of step. The chains shall be made of high grade, heat treated, flat steel links with hardened pins and accurate rollers designed to accurately engage the drive sprockets to insure smooth operation. Each pair of step chains shall be a matched set.

2. Provisions shall be made to prevent sagging or buckling of the linkages, to prevent the steps from coming in physical contact with one another, and to maintain a constant distance between the step axles. Automatic tensioning devices shall be provided to maintain tension under load and to compensate for wear.

3. A means for individual fine adjustment of tension for each linkage shall be provided.

4. Step chains shall be constructed to permit removal of segments as may be required for replacement purposes.

5. Support rollers shall be spaced to distribute load and to guide linkage throughout run. Rollers shall be constructed of polyurethane material, with diameter sufficient to provide reliability, maintainability, smoothness of motion, and to operate within noise level requirements specified. Rollers shall be affixed in a manner that ensures positive roller retention but allows for replacement.

6. Step chain and chain pins shall have a minimal diameter of at least five-eighths (5/8) of an inch and have a tensile strength suitable for the application. The chains shall have a factor of safety of not less than six (6).

7. A test certificate for the chain breaking load shall be provided.

M. Tracks: The tracks shall be constructed of continuous structural steel sheet, strip or plate throughout the truss, incline and transition curves at the upper an lower landings in order to restrain the lateral displacement of the steps, ensure the rollers are retained in their proper position on the track and to provide a smooth ride without discernible vibration.

1. Design and fabrication of tracks shall retain steps, step rollers, and running gear safely under load requirements and at the highest speed specified.

2. Contractor shall assemble and secure sections of track together for easy removal and replacement of defective sections. The system shall be adjustable, and welding of the track sections is not acceptable.

3. Design of the mechanical components shall provide for easy installation and removal without the dismantling of parts of the truss or building structure.

4. Tracks shall be properly supported on trusses to provide correct alignment and smooth, even operation of running gear. The rolling surface of the track shall be a minimum thickness of 3 mm.

5. The guiding system for the step chains and step rollers shall be fabricated from zinc plated or galvanized steel profiles with smooth and even running surfaces. The guide profiles shall not be welded together at the joints.

N. Step Driving Machines: The driving machines shall be of the electric motor driven, worm gear type, especially designed for escalator service, provided with precision cut and matched ground steel worms and worm gears; ball thrust bearings and roller shaft bearings and driven by single speed motors. Run gearing in oil bath in an oil tight housing with appropriate shaft seals. Mount the driving machine within and to the truss and connect the main drive shaft to the sprocket assembly, with a gear and chain driven by the driving machine. Design driving motor and motor switch gear to provide a smooth start, and prevent undue strain on drive components. The motor shall be of sufficient size, to operate the escalator at full rated capacity, per Code without exceeding the rated horsepower. The motor shall be AC, polyphase, induction type continuous rated with a temperature rise not exceeding those in the NEMA and IEEE Standards. Flange mount motor to the drive machine.

1. A reservoir with a low oil signal to the controller, and a minimum capacity of two and one half (21/2) gallons shall be provided.

2. Reservoir level indications shall be provided where lubricants are contained within housings, supply tanks and larger filler cups.

3. Provide a sight glass or dipstick method of determining oil level in the case. The case shall provide a convenient method of draining the oil.

4. The sprockets shall be precision machined to distribute the load evenly on the sprocket teeth and on the chain rollers and shall be designed for smooth operation.

5. Shafts shall be designed for ease of assembly or disassembly.

6. Main drive bearings shall be rated for L10, 200,000 hours.

O. Sprocket Assemblies:

1. Attach the main sprocket assembly rigidly to the truss, at both sides, to ensure and maintain proper alignment.

2. Mount the lower sprocket assembly on rollers, operating on tracks, rigidly attached to the truss at both sides, to automatically maintain proper tension on the step chains, by means of weights or compression springs.

3. Provide roller type main drive shaft bearings.

4. Design chain sprockets to accurately distribute the load evenly on the sprocket teeth and chain rollers.

P. Brake:

1. Provide each escalator with a permanent magnet ceramic brake, located on the high speed shaft which, when activated, shall stop the escalator in the event of a normal stop control, activation of stop button, activation of any safety device, o upon loss of power.

2. Provide a load compensating brake system capable of automatically stopping a moving escalator quickly but gradually, and able to hold the escalator stationary under full load whenever the power is interrupted. The brake shall be "fail safe" and electrically released. When a stop is initiated, the system shall maintain a relatively constant deceleration independent of the load. The brake shall not cause the escalator to come to an abrupt stop. It shall be designed to meet ASME A17.1 Code for deceleration requirements without adjustment. Design of brake shall provide ease of access for inspection.

Q. Controllers: Provide microprocessor type designed to connect the escalator motor to the electric service, protect the motor against overload and to provide proper control of the escalator. Should power failure occur, or any safety device operate, the controller shall automatically cut off power to the motor and apply the service brake to bring the escalator to a quick and smooth stop. In addition the controller shall include phase and overload protection, and shall monitor the condition of each safety switch, the brake and motor operation.

R. Control Station: Provide a control station at both the top and bottom landings, located near the handrail inlet, include a key actuated direction starting switch at each station. Restarting shall require first positioning the key to "normal" (center position), and then selecting the appropriate direction. Restarting with the key in the “normal” position shall be prevented by the controller.

1. Per Reference Standard RS-18 the right side position for starting the escalator in the upward direction shall be marked “start-up”, and the left side position for starting the escalator in the downward direction shall be marked “start-down”. The starting devices shall be protected by a locked, transparent cover plate that can be opened by the starting key and clearly marked “For Start Only”. Starting devices shall be located at the top and bottom of the escalator on the right side facing newel.

2. Provide a manual reset switch adjacent to each control station at top and bottom landings.

S. Additional Safety Devices: Provide all safety devices required by Code including, but not limited to, the following. Design all safety devices to operate in accordance with the requirements of the Code.

1. Emergency Stop Buttons: Emergency stop buttons shall be provided, designed so that the momentary pressure of either button shall cut off the power supply to the motor and brake to bring the escalator to rest.

   a. One emergency stop button shall be located at each landing. Location shall be in the upper quadrant, 45 degrees above horizontal, in order to provide easy access. The stop button shall be red in color.

   b. The button shall be housed under a clear, high impact resistant plastic cover, which shall be self-closing. Instructions for operating the stop button shall be imprinted on the cover in half-inch high letters. When the cover is lifted, an audible alarm shall sound until the cover is returned to its closed position.

2. Broken Step Chain, and Broken Drive-Chain, Devices: Broken chain safety devices shall be provided with a safety switch for each chain designed to cut off the current and bring the escalator to rest should either chain break.

3. Pit Stop Switch: Each escalator shall be provided with an additional safety device, in the pit that shall interrupt power within the escalator and automatically apply the brake to bring the escalator to a smooth stop.

4. Skirt Obstruction Devices: As required by Reference Standard RS-18, means shall be provided to cause the electric power to be removed from the escalator driving machine and motor and brake, if an object becomes caught between the step and the skirt as the step approaches the upper comb plate, intermediate device, or lower comb plate. On units having a run or 20 feet or more intermediate devices shall be provided on both sides of the escalator with devices located at interval of 10 feet or less. The activation intermediate devices shall stop the escalator at a rate not greater than 3 feet per second square in the direction of travel. The upper and lower comb plate devices shall be located so that the escalator will stop before the object reaches the comb plate. The activation of any skirt device shall stop the escalator with any load up to full brake rated load with escalator running. Switches shall be of the plunger, self-resetting type, adjustable to maintain the required position and clearance from the skirts.

5. Reversal Stop Devices: The reversing device shall be designed to stop the escalator automatically, should the direction of travel be accidentally reversed while the escalator is operating in the ascending direction.

6. Step Up-Thrust Devices: Means shall be provided to cause the electric power to be removed from the driving machine motor and break should a step be displaced against the upthrust track at the lower curve in the passenger carrying line of the track system.

7. Step Level Devices: Step level devices shall be located at the top and bottom of each escalator. These devices shall detect downward displacement of 1/8” or greater at the riser end at either side of the step. When activated, the device shall cause the escalator to stop prior to the step entering the combplate. The device shall cause power to be removed from the driving machine motor and brake.

8. Handrail Inlet Safety Devices: A handrail inlet safety device shall be provided at the handrail inlet in the newel. The electrical switch of this device shall be designed to cut off the current and bring the escalator to rest should either an object become caught between the handrail and the handrail guard or an object approaches the area between the handrail and handrail guard.

9. Comb Step Impact Devices: Per Reference Standard RS-18 two independent safety devices, one at the side of the comb plate and the other at the center of the front edge of the comb plate shall be provided at the top and bottom landing comb plates which will cause the opening of the power circuit to the escalator drive machine motor and brake if either:

    a. a horizontal force in the direction of travel is applied exceeding 225 lbf at either side or exceeding 500 lbf at the center of the front edge of the comb plate; or,

    b. a resultant vertical force in upward direction is applied exceeding 150 lbf at the center of the front of the combplate.

10. Comb-Step Stop Device: Per Reference Standard RS-18 on every new escalator a comb-step stop device shall be provided at the upper and lower comb steps. Any obstruction exerting a pressure of 60 pounds for steps over 32 inches in width between the step tread and the comb step shall activate the comb step stop device to cause the electric power to be removed from the escalator driving machine motor and brake.

11. Handrail Speed Monitoring Devices: A handrail speed monitoring device shall be provided which will cause the immediate activation of the audible alarm required for the emergency stop buttons whenever the speed of either handrail deviates from the step speed by 15% or more. The device shall cause electric power to be removed from the driving machine motor and brake if the speed deviation of 15% or more is continuous for more than 2 seconds.

12. Missing Step Switch: This safety feature shall be provided to prevent the unit from running if a step is missing.

13. Tandem Operation: Tandem operation escalators shall be electrically interlocked where traffic flow is such that bunching will occur if the escalator carrying passengers away from the intermediate landing stops. The electrical interlocks shall stop the escalator carrying passengers into the common intermediate landing if the escalator carrying passengers away from the landing stops. These escalators shall also be electrically interlocked to assure that they run in the same direction.

14. Step Demarcation Lights: Step demarcation lights shall be furnished at the top and bottom landings of each escalator. They shall consist of a light fixture installed just below the track system where the step leaves or enters the comb plate. This fixture shall be furnished with two independently operating green fluorescent lamps and shall be capable of lighting the entire width of the step. The light shall be visible between the steps. The lamps shall be activated whenever the escalator is in operation.

15. Safety Signs: Worded and pictorial signage meeting the requirements of the ASME Code shall be provided at both the upper and lower landings.

16. Brushes: Provide brushes to cover side step gaps.

T. Remote Monitoring: Provide an interactive monitoring and diagnostic system tied to each individual elevator, escalator, and moving walk ready for connection to the new building management system (BMS).

1. Lift-Net ; Integrated Display Systems, Inc.

U. Energy-Saving Feature: Provide escalator motors and controls designed for motors to run on partial windings (at reduced power) when not under full load.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Refer to Section 14 20 00, VERTICAL TRANSPORTATION, GENERAL.

3.2 ESCALATOR SCHEDULE

A. Number Required: Four (4).

B. Unit Numbers: 1, 2, 3, 4, 5, 6.

C. Location:

1. Escalators 3 & 4: Ticketing to Security

2. Escalators 5 & 6: Security to Concourse

D. Vertical Rise:

1. Escalators 3 & 4: 24'-2"

2. Escalators 5 & 6: 13'-1"

E. Lengths: As required by the escalator manufacturer.

F. Step Width: 40”.

G. Maximum Speed: 100 feet/minute.

H. Power Characteristics: 480 Volts, 3 Phase, 60 Hertz.

I. Maintenance Service: Provide 12-month maintenance for all escalators with 24-hour callback service, as-built wiring diagrams, operating instructions, and parts ordering information, remote wiring to fire alarm panel.

J. Warranty: Provide 12 month warranty beginning at date of acceptance by Owner

SECTION 21 12 00 – FIRE SUPPRESSION STANDPIPES

PART 1 GENERAL

1.1. DESCRIPTION OF WORK

A. Scope: This work includes providing new fire suppression standpipes or combination standpipe/sprinkler risers in support of the new addition within the Portland Jetport; all as described herein and on the contract drawings for the Portland Jetport. The systems shall include all piping, fittings, hangers, valves, flow switches, tamper switches, check valves, drains, and all other accessories and miscellaneous items required for a complete standpipe system, even though each item may not be specifically mentioned or described. The standpipes shall be tested and ready for full operation prior to acceptance by the Authority Having Jurisdiction (AHJ).

B. Extent of the Work: The system shall be installed in accordance with the drawings, specifications, and referenced publications. Any conflicts between these documents shall be brought to the attention of the Fire Protection Engineer responsible for the job and the Project Manager.

C. Compliance: The standpipe systems shall be installed in accordance with Section 1.4 A. Any reference to "authority(ies) having jurisdiction" shall be interpreted to mean the Maine State Fire Marshals Office and Portland Fire Department. All material and equipment used shall be listed and/or approved by UL, FM, or another nationally recognized testing agency for their intended use and service.

D. Related Sections and Divisions:

1. Refer to Division – 7:

    a. Specification 078412 – Penetration Firestopping

2. Refer to Division – 9:

    a. Specification 099123 – Interior Painting

3. Refer to Division – 23:

    a. Mechanical Basic Requirements
    b. Supports and Anchors
    c. Mechanical Identification
    d. Valves
    e. Gauges

1.2 SCOPE OF WORK

A. Design, installation (including all materials and equipment), and final inspection and testing of a complete and ready for operation fire-suppression wet standpipe system as required by NFPA 14 and/or as modified herein.

B. Modification of the existing standpipe system as indicated on the drawings and as further required by these specifications.

C. Expansion or revision of the building system fire alarm system to incorporate new system alarms and supervisory devises.

D. Providing of access panels where control or drain valves are located behind plaster or gypsum walls or ceilings.

E. Painting of exposed piping and supports to match surrounding background in stairways and red in unfinished areas.

1.3 QUALITY ASSURANCE

A. Provide an installed design, materials and devices for a standpipe system, complete, conforming to National Fire Protection Association (NFPA) Standard 14, latest edition, except as otherwise or additionally specified herein.

B. Designer and Installer Requirements: All standpipe system design, including shop drawings, shall be by a NICET Level III or IV Sprinkler Technician or a Registered Fire Protection Engineer. Installation of the standpipe system shall be performed by a certified sprinkler contractor with a minimum of 3 years of experience. A NICET Level III or higher Sprinkler Technician shall supervise installation. The Project Manager may reject any proposed installer who cannot show evidence of such qualifications.

C. The Contractor shall submit the following at the time of proposal submission for verification of qualifications:

1. Submit documentation, to the Project Manager, showing that the Contractor has successfully installed automatic fire suppression sprinkler and standpipe systems of comparable size, type, and design as specified herein or that the Contractor has a firm contractual agreement with a Subcontractor having such experience.
2. When a Subcontractor performs work, the Contractor shall submit a copy of the subcontract, along with the Subcontractor qualifications, to the Project Manager.
3. The data shall include the names and locations of at least five installations where the Contractor, or Subcontractor if applicable, installed such systems.
4. The Contractor, or Subcontractor, shall certify that each system has performed satisfactorily for a period of not less than one year.

D. Project Superintendent: The Contractor, or Subcontractor, shall provide one qualified, full-time, on-site staff member designated as the "Project Superintendent".

1. 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).

2. The Project Superintendent shall be thoroughly familiar with all contract obligations and shall have authority to make all contractual decisions within the scope of the contract.

3. 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.

4. The Project Superintendent shall also be responsible for ensuring that all submittals are accurate and fully coordinated.

E. Warranty and Guarantees: The Contractor shall provide a Warranty of Construction and Guarantees. Final Acceptance includes, but is not limited to, successful final acceptance testing, the receipt of as-built drawings, and operation and maintenance manuals.

F. Codes and Standards: Provide fire suppression standpipe systems conforming to the latest editions of the following codes and standards:

1. National Fire Protection Association (NFPA), including all technical amendments:
   a. NFPA 13 – Standard for the Installation of Sprinkler Systems
   b. NFPA 14 – Standard for the Installation of Standpipe, Private Hydrant and Hose Systems
   c. NFPA 24 – Standard for the Installations of Private Fire Service Mains
   d. NFPA 101 – The Life Safety Code®

2. American Water Works Association (AWWA)
   a. AWWA C651 (Addendum 1990) Disinfecting Water Mains)

3. Factory Mutual Engineering and Research Corporation (FM)
   a. FM-P7825 Approval Guide

4. Underwriters Laboratories Inc. (UL)
   a. UL-FPED Fire Protection Equipment Directory

5. International Code Council (ICC)
   a. International Building Code.
   b. International Fire Code.
   c. International Mechanical Code

1.5 DESIGN CRITERIA

A. The design, materials, equipment, installation, and testing of the system shall be in accordance with NFPA 14, latest edition, or as modified herein.

B. For hydraulic calculations, calculated demand shall not fall less than 10 percent below the water supply curve.

C. Size standpipes to provide 65 psig at the most remote connections, per State and Local requirements.

1.6 SUBMITTALS

A. Prepare detailed working drawings that are stamped by a Registered Professional Engineer, practicing in the field of Fire Protection Engineering, or a NICET Certified Designer; with a minimum Level III certification. The installing Contractor remains responsible for correcting any conflicts with other trades and building construction that

arise during installation. Partial submittals will not be accepted. Material submittals shall be approved prior to the purchase or delivery to the job site. Suitably bind submittals in notebooks or binders and provide an index referencing the appropriate specification section. Submittals shall include, but not be limited to, the following:

1. Certificates:
   a. Designer's and Installer's qualifications and documentation of previous work.
   b. Materials and Testing certificates as specified.
2. Drawings: Submit detailed 1:100 (1/8 inch) scale (minimum) working drawings conforming to NFPA 14. Include a site plan showing the fire hydrant nearest the fire department connection.
3. Manufacturers Literature and Data Sheets: All pertinent literature and data for the materials and equipment proposed for the project. Include listing information and installation instructions in data sheets. Clearly identify the item to be used.
4. Calculation Sheets: Submit hydraulic calculations in accordance with NFPA 14.

B. Final Document Submittals: Provide as-built drawings and testing and maintenance instructions. Submittals shall include, but not be limited to, the following:

1. One complete set of reproducible as-built drawings showing the installed system with the specific interconnections between the water flow switch or pressure switch and the fire alarm equipment. One copy of final CADD drawing files shall be provided on CDs.
2. Four (4) sets of complete, simple, understandable, step-by-step, testing instructions giving recommended and required testing frequency of all equipment, methods for testing all equipment, and a complete trouble shooting manual. Provide maintenance instructions on replacing any components of the system including internal parts, periodic cleaning and adjustment of the equipment and components with information as to the address and telephone number of both the manufacturer and the local supplier of each item.
3. Certificates shall document all parts of the installation.
   a. Designer's and Installer's qualifications and documentation of previous work.
   b. Materials and Testing certificates as specified.
4. Instruction Manual: Provide one copy of the instruction manual covering the system in a flexible protective cover and mount in an accessible location adjacent to the riser.

PART 2 PRODUCTS

2.1 GENERAL

A. All devises and equipment shall be Underwriters Laboratories listed for their intended purpose.

2.2 PIPING & FITTINGS

A. Shall be in accordance with NFPA 14. Black steel, schedule 10 minimum.

B. Threaded or flanged fittings shall be ANSI B 16.3 cast iron, class 125 minimum. Threaded fittings are not permitted on pipe with wall thickness less than Schedule 40.

C. Clamp-on fittings with rubber gaskets shall be listed for the piping application.

D. Plain end pipe, fittings with locking lugs or shear bolts are not permitted. Use nonferrous piping in MRI Scanning Rooms.

2.3 VALVES

A. Do not use quarter turn ball valves for 2 inch or larger drain valves.

B. The wet system control valve shall be a listed indicating type valve. Control valve shall be UL Listed and FM Approved for fire protection installations. System control valve shall be rated for normal system pressure but in no case less than 175 PSI. (No Substitutions Allowed).

D. Listed Indicating Valves:

1. Gate: OS&Y, 175 psig WOG.
2. Butterfly: Gear operated, indicating type, 175 psig WOG.

E. Check Valves: Swing type, rubber faced or wafer type spring loaded butterfly check valve, 175 psig WOG.

F. Drain Valves: Threaded bronze angle, globe, ball or butterfly, 150 psig. WOG equipped with reducer and hose connection with cap or connected to a drain line.

G. Standpipe Hose Valves: 2-1/2 inch screwed, brass hose angle valve, male hose threads same as local fire protection service, 2-1/2 inch by 1-1/2 inch reducer, and with permanently attached polished brass cap and chain.

H. Automatic Ball Drips: Cast brass 3/4 inch in-line automatic ball drip with both ends threaded with iron pipe threads.

2.4 IDENTIFICATION SIGNS/HYDRAULIC PLACARDS

A Provide for all new and existing sectional valves, riser control valves, drain valves and alarm devises. The signs shall be in accordance with NFPA 14 and attached securely to each item.

B Provide plastic, steel or aluminum signs with white lettering on a red background with holes for easy attachment. Enter pertinent data for each system on the hydraulic placard.

2.5 VALVE SUPERVISORY SWITCHES:

A. Provide each indicating standpipe and control valve with adequate means for mounting a valve supervisory switch.

B. Mount switch so as not to interfere with normal operation of the valve and adjust to operate within two revolutions toward the closed position of the valve control, or when the stem is moved no more than one fifth of the distance from its normal position.

C. The mechanism shall be contained in a weatherproof die cast aluminum housing, which shall provide a 3/4 in. tapped conduit entrance and incorporate the necessary facilities for attachment to the valves.

D. Switch housing to be finished in red baked enamel.

E. Water flow Alarm Switches: Mechanical, non-coded, non-accumulative retard and adjustable from 0 to 60 seconds minimum. Set flow switches at an initial setting between 20 and 30 seconds.

F. Valve Supervisory Switches for Ball and Butterfly Valves: May be integral with the valve.

G. All conduit and wiring connected thereto shall be provided in Section 28 31 13, FIRE DETECTION AND ALARM.

2.8 GAUGES

A. Provide gauges as required by NFPA 14.

2.9 PIPE HANGERS AND SUPPORTS

A. Supports, hangers, etc., of an approved pattern placement to conform to NFPA 14. System piping shall be substantially supported to the building structure. Materials used in the installation or construction of hangers and supports shall be listed and approved for such application. Hangers or supports not specifically listed for service shall be designed and bear the seal of a professional engineer.

2.10 WALL, FLOOR AND CEILING PLATES

A. Provide chrome plated steel escutcheon plates for exposed piping passing though walls, floors or ceilings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation shall be accomplished by the licensed contractor. Provide a qualified technician, experienced in the installation and operation of the type of system being installed, to supervise the installation and testing of the system.

B. Installation of Piping: Accurately cut pipe to measurements established by the installer and work into place without springing or forcing. Install concealed piping in spaces that have finished ceilings. Locate piping in stairways as near to the ceiling as possible to prevent

tampering by unauthorized personnel, and to provide a minimum headroom clearance of seven feet six inches. To prevent an obstruction to egress, provide piping clearances in accordance with NFPA 101.

C. Welding: Conform to the requirements and recommendations of NFPA 14.

D. Drains: Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 14.

E. Valve Supervisory Switches: Provide supervisory switches for standpipe control valves. Do not provide standpipe hose valves and test and drain valves with supervisory switches. Do not provide valve supervisory switches on standpipe hose valves, test or drain valves. See Section 28 31 13, FIRE DETECTION AND ALARM for connections.

F. Water flow Alarm Switches: Install water flow switch and adjacent valves in easily accessible locations.

G. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective water flow switch or pipe connection near to the pipe from where they were cut.

H. Provide pressure gauge at each water flow alarm switch location, at the top of each standpipe, and at each main drain connection.

I. Penetrations: Sleeve or core drill concrete and masonry. Provide clearance between pipe and openings as required by NFPA 14. Seal penetrations and clearances in fire rated wall and floor assemblies with listed through-penetration firestop materials in accordance with Section 07 84 12, PENETRATION FIRESTOPPING.

J. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at each sectional control valve where there is a zone water flow switch.

K. Interruption of Service: There shall be no interruption of the existing sprinkler protection, water, electric, or fire alarm services without prior permission of the Project Manager. Contractor shall develop an interim fire protection program where interruptions involve in occupied spaces. Request in writing at least one (1) week prior to the planned interruption.

3.2 INSPECTION AND TEST

A. Flushing: Flush newly installed systems prior to performing hydrostatic tests in order to remove any debris which may have been left as well as ensuring piping is unobstructed.

B. Hydrostatic Testing: Hydrostatically test the system including the fire department connections, as specified in NFPA 14, NFPA-25, and NFPA 13 latest edition, in the presence of the Authority Having Jurisdiction or his designated representative, Project Manager, and Fire Protection Engineer.

C. Final Inspection and Testing: Test the system in accordance with NFPA 14, NFPA 25 and NFPA 13 latest editions after all necessary corrections have been accomplished. Advise the Project Manager and Fire Protection Engineer who will then schedule the final inspection and test. Furnish all instruments, labor and materials required for the tests and provide the services of the installation foreman or other competent representative of the installer to perform the tests. Correct any deficiencies found and retest the system. Include the operation of all features of the systems under normal conditions in the test.

3.3 INSTRUCTIONS

A. Furnish the services of a competent instructor for not less than two hours for instructing Jetport and Portland Fire Department personnel in the operation and maintenance of the system, on the dates requested by the Project Manager.

3.4 WARRANTY

A. All work performed and materials and equipment furnished under this contract shall be free from defects for a period of one year from date of acceptance by the government.

B. All new piping and equipment incorporated into the new system shall be hydrostatically tested and warranted as new.

END OF SECTION 21 12 00

SECTION 21 13 13 - WET-PIPE SPRINKLER 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. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.
7. Other fire sprinkler related appurtenances

B. Related Sections:

1. Division 1 Section “Submittal Procedures”
2. Division 7 Section “Firestopping”
3. Division 7, Section “Applied Fireproofing”
4. Division 9, Section “Painting”
5. Division 21 Section "Fire-Suppression Standpipes"
6. Division 28, Section “Digital Addressable Fire Alarm Systems”

1.3 DESCRIPTION OF WORK

A. Scope: Provide a complete wet-pipe automatic sprinkler system, and associated equipment, ready for operation.

B. Description of Work: This work includes providing both a new wet-pipe automatic sprinkler system for the new addition within the Portland Jetport, as well as providing sprinkler coverage within the portions of the existing facility; all as described herein and on the contract drawings for the Portland Jetport. The systems shall include all piping, sprinklers, fittings, hangers, valves, flow switches, tamper switches, check valves, riser trim package(s), back-flow preventers, drains, inspector’s test connections, and all other accessories and miscellaneous items required for a complete operating system, even though each item may not be specifically mentioned or described. The sprinkler systems shall be tested and ready for full operation prior to acceptance by the Authority Having Jurisdiction (AHJ).

C. Compliance: The entire wet-pipe automatic sprinkler system shall be designed in accordance with the specification. Any reference to "authority having jurisdiction" shall be interpreted to mean the Maine State Fire Marshals Office and Portland Fire

Department. All material and equipment used shall be listed or approved by UL, FM or another nationally recognized testing agency, for their intended use and service.

1.4 PERFORMANCE REQUIREMENTS

A. General: Design automatic fire sprinkler systems in accordance with all required and advisory provisions of the latest editions of NFPA 13 and NFPA 415, including all the Annexes and except where modified herein, by hydraulic calculations for the hazard occupancy shown on the drawings with uniform water distribution over the design area. Each system shall be designed using the area/density design approach as defined by NFPA 13. The room design method shall not be used. Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts and other construction and equipment in accordance with detailed working drawings to be submitted for approval.

1. General Design Area Sizes and Densities

   a. Provide the appropriate sprinkler design density based on the occupancy hazard or commodity classification of the space being protected in accordance with NFPA 415 or NFPA 13.
   b. The discharge area shall be the hydraulically most demanding area as specifically noted below.

2. Specific Design Area Sizes and Densities

   a. Storage Rooms in excess of 1,500 ft2 shall be sprinkler protected in accordance to NFPA 13 Ordinary Hazard Group II.
   b. Loading Docks shall be sprinkler protected in accordance to NFPA 13 Ordinary Hazard Group II.
   c. Trash collection rooms shall be sprinkler protected in accordance to NFPA 13 Ordinary Hazard Group II.
   d. Passenger-handling areas shall be sprinkler protected in accordance with NFPA 13 Ordinary Hazard Group 1 Occupancy.
   e. Baggage, package, and mail-handling areas shall be sprinkler protected in accordance to NFPA 13 Ordinary Hazard Group II.
   f. Kitchens shall be sprinkler protected in accordance to NFPA 13 Ordinary Hazard Group I.
   g. Compact Mobile Shelving and Track file system storage shall be sprinkler protected at a density of .30 gpm/ft2 over the most hydraulically remote 1,500 ft2. Each sprinkler shall cover no more than 100 ft2.

B. Total Combined Inside & Outside Hose Allowances: Hydraulic calculations shall include an allowance of 500 gpm for hose streams, added at the point of connection to the water supply

C. Water Supply Information

1. Available fire-hydrant flow test records indicate the following conditions:

   a. Date: September 16, 2008
   b. Time: Approx. 1:00 a.m.

c. Performed by: Portland Water District
d. Location of Residual Fire Hydrant: Hydrant POD-HYD01653 (International Parkway at Existing Jetport)
e. Location of Flow Fire Hydrant: Hydrant POD-HYD01817 (340' South of Jetport Blvd)
f. Static Pressure at Residual Fire Hydrant: 90 psig
g. Measured Flow at Flow Fire Hydrant: 2510 gpm
h. Residual Pressure at Residual Fire Hydrant: 84 psig

D. Sprinkler System Layout: Approved by AHJ.

E. Other Design Criteria:

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Maximum protection area per sprinkler shall be per NFPA 13.
3. Interior pipe coatings are specifically prohibited where not listed for fire protection use.
4. Total Combined Hose-Stream Demand Requirement shall be according to NFPA 13.
5. For areas subject to temperatures below 40 degrees F::

a. Provide dry pendent or dry sidewall sprinklers.
b. Anti-Freeze systems shall not be installed.
c. Heat Tape systems shall not be installed.

F. Seismic Performance: As required, sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and the building code.

1. Seismic Expansion Joints: As/if required, provide flexible piping systems of a length that exceeds the maximum design movement of seismic expansion joints. The use of 90 degree fittings in pipe as shown in NFPA 13 is specifically prohibited.

1.5 SUBMITTALS

A. Submittals to be in accordance with Division 1, Submittal Procedures unless otherwise indicated by this section.

B. Product Data: Submit four (4) bound sets of submittals for each type of product indicated to the Project Manager and Fire Protection Engineer for review and approval. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Partial submittals will not be acceptable and will be returned without review. Manufacturer's data shall be provided for all products listed in Part 2 of this specification and annotated to show the specific model, type and size of each item:

C. Shop Drawings: For wet-pipe sprinkler systems, submit four (4) sets of drawings that include all information as required by NFPA 13 to the Project Manager and Fire Protection Engineer for review and approval. The drawings shall be prepared on uniform sized sheets not less than 30 in by 42 in (760 by 1070 mm). Partial submittals will not be acceptable and will be returned without review. Include plans, elevations, sections, details, isometric diagram of sprinkler system riser piping showing all control valve locations, and attachments to other work.

1. Layout indicating details, plan view, elevations and sections of the system piping. Indicate the location of sprinklers and piping in relation to the ceiling layout, showing pipe lengths and sizes.
2. Detailed riser diagram including isometric diagrams showing schematic of systems supply, supply connection, devices, valves, pipe and fittings.
3. Point-to-point electrical wiring diagrams for all alarm and supervisory devices.
4. The signature and seal of a registered Professional Fire Protection Engineer, or the signature and certification number of a NICET Level III or IV Sprinkler Technician.

D. Hydraulic Calculations. Submit name of hydraulic program and comply with the following:

1. Where a single riser supplies water to more than one floor or level, separate calculations shall be performed for the hydraulically most demanding area of each floor or level served.
2. Minimum operating pressure of any sprinkler shall be according to NFPA 13 and appropriate UL listing or FM approval.

E. Verification of Qualification. Prior to installation, submit documentation, to the Project Manager and Fire Protection Engineer, showing that the Contractor has successfully installed automatic fire suppression sprinkler systems of comparable size, type and design as specified herein or that the Contractor has a firm contractual agreement with a Subcontractor having such experience.

1. The data shall include the names and locations of at least three installations where the Contractor, or Subcontractor, installed such systems.
2. The Contractor, or Subcontractor, shall certify that each system has performed satisfactorily for a period of not less than one year.
3. The Contractor of Subcontract shall submit the NICET/PE certification/license number and expiration date.

F. As Built Drawings:

1. General: Prepare and submit four (4) sets of detailed "As-Built" Drawings to the Project Manager and Fire Protection Engineer. 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 13. The drawings shall be prepared on uniform sized sheets not less than 30 in by 42 in (760 by 1070 mm). Submit these drawings within two weeks after the final acceptance test of the system.

2. Provide two (2) sets of CAD based electronic as-built drawings to the Project Manager and Fire Protection Engineer; each set shall include DWG and DWF file formats, including all associated externally referenced electronic files (Xref's). These files shall contain externally referenced files that have been inserted (do not bind the Xref's). Provide both DWG and DWF file formats on two (2) separate recordable CD-R's (do not use CD-RW's or DVD-R/RW's). In addition, provide in each set a read only PDF copy of each As-Built drawing for archiving purposes. PDF files shall be created using the PDF Creator utility. These three (3) CD-R's shall be

formatted, written to, and the recording session closed in such a manner as to prevent additional electronic file transfers to the recordable CD-R's.]

G. Field Test Reports and Certificates: Submit test certification, to the Project Manager and Fire Protection Engineer, for all pipe and fittings. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

H. Operation and Maintenance Data: Not less than 14 calendar days prior to the final acceptance testing of the entire system, and for use during the instruction period hereinafter specified, provide three (3) bound copies of an Operation and Maintenance Manual to the Project Manager and Fire Protection Engineer. 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 description of the part. The manual shall include all data relative to alarm valves, water flow switches and tamper switches.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Layout and hydraulic calculation shall be performed by a NICET Level III or IV Technician certified in Automatic Sprinkler Systems Layout or a Registered Fire Protection Engineer.
2. Installation shall be performed by a licensed sprinkler contractor who is experienced in the layout and installation of automatic sprinkler systems (minimum 3 years) of comparable size and type.
3. Installer's responsibilities include layout, fabrication, and installation of sprinkler systems. Layout calculations shall be based on the fire-hydrant flow test data provided.
4. Drawings shall be sealed by a licensed Professional Fire Protection Engineer or be stamped by a NICET Level III or IV Technician certified in Automatic Sprinkler Systems Layout.

B. Applicable References: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the latest editions of the following codes and standards:

1. National Fire Protection Association (NFPA), including all amendments and annexes

a. NFPA 13 – Standard for the Installation of Sprinkler Systems.
b. NFPA 14 – Standard for the Installation of Standpipe and Hose Systems.
c. NFPA 24 – Standard for the Installations of Private Fire Service Mains.
d. NFPA 70 – The National Electrical Code®
e. NFPA 72 – The National Fire Alarm Code®
f. NFPA 101 – The Life Safety Code®
g. NFPA 415 – Standard on Airport Terminal Buildings, Fueling Ramp Draining, and Loading Walkways.

2. Underwriter's Laboratories (UL) - "Fire Protection Equipment Directory"

3. Factory Mutual Global (FM) – Approval Guide

4. American Standard for Testing Materials (ASTM)

   a. ASTM A53/A53M, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
   b. ASTM A47/A47M, "Standard Specification for Ferritic Malleable Iron Castings"
   c. ASTM A153, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
   d. ASTM A234/A234M, "Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service"
   e. ASTM A536, "Standard Specification for Ductile Iron Castings"
   f. ASTM A733, "Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples"
   g. ASTM A795, "Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use"
   h. ASTM A865, "Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints"
   i. ASTM B75/B75M, "Standard Specification for Seamless Copper Tube"
   j. ASTM B88, "Standard Specification for Seamless Copper Water Tube"
   k. ASTM B584, "Standard Specification for Copper Alloy Sand Castings for General Applications"
   l. ASTM B633, "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel"
   m. ASTM F2014, "Standard Specification for Non-Reinforced Extruded Tee Connections for Piping Applications"

5. American Water Works Association (AWWA)

   a. AWWA C110, "Standard for Ductile Iron and Gray Iron Fittings for Water"
   b. AWWA C606, "Standard for Grooved and Shouldered Joints"

6. American Society of Mechanical Engineers (ASME)

   a. ASME B1.20.1, "Pipe Threads, General Purpose"
   b. ASME B16.1, "Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250"
   c. ASME B16.3, "Malleable Iron Threaded Fittings"
   d. ASME B16.4, "Gray Iron Threaded Fittings"
   e. ASME B16.5, "Pipe Flanges and Flanged Fittings: NPS 1/2 through 24"
   f. ASME B16.9, "Factory-Made Wrought Buttwelding Fittings"
   g. ASME B16.21, "Nonmetallic Flat Gaskets for Pipe Flanges"
   h. ASME B16.22, "Wrought Copper and Copper Alloy Solder Joint Pressure Fittings"
   i. ASME B16.24, "Cast Copper Alloy Pipe Flanges and Flanged Fittings: Classes 150, 300, 600, 900, 1500 and 2500"
   j. ASME B18.2.1, "Square and Hex Bolts and Screws, Inch Series"

7. American Welding Society (AWS)

   a. A5.8, "Specification for Filler Metals for Brazing and Braze Welding"

b. D10.12/D10.12M, “Guide for Welding Mild Steel Pipe”

8. Manufacturer’s Standardization Society (MSS)

a. SP-123, “Non-Ferrous Threaded and Solder-Joint Unions for Use With Copper Water Tube”

9. Copper Development Association (CDA)

a. Copper Tube Handbook

10. International Code Council (ICC)

a. International Building Code (IBC)]
b. International Fire Code (IFC)
c. International Mechanical Code (IMC)

C. Guarantee. 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 AHJ. Final Acceptance includes, but is not limited to, the receipt of as-built drawings and operation and maintenance manuals.

D. Conflicts. The system shall be installed in accordance with the drawings, specifications, and referenced publications. Any conflicts between these documents shall be brought to the attention of the Project Manager and Fire Protection Engineer.

1.7 PROJECT CONDITIONS

A. Interruption of Existing Sprinkler Service: Do not interrupt sprinkler service to facilities without prior approval of the Project Manager:

1. Existing Sprinkler Equipment: Existing sprinkler equipment to remain shall be maintained operational to the fullest extent possible.
2. When sprinkler interruption is necessary, a written plan for putting the system back into service shall be submitted to the Project Manager and Fire Protection Engineer.
3. Equipment Removal: After acceptance of the new system, all existing equipment so indicated shall be removed and all damaged surfaces shall be restored as herein specified.

1.8 COORDINATION

A. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.

B. Sprinklers shall be located in center of ceiling tile in all acoustical tile drop ceilings.

PART 2 - PRODUCTS

2.1 All products shall be UL listed or FM approved for Fire Protection Service unless specifically allowed otherwise by this specification.

2.2 PIPING MATERIALS

A. Materials shall be steel, ductile iron, or copper.

2.3 STEEL PIPE AND FITTINGS

A. Schedule 40, Black-Steel Pipe: ASTM A795, in NPS 2 inches and smaller. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Black-Steel Pipe: ASTM A795, Schedule 10 in pipe greater than NPS 2 inches. Pipe ends may be factory or field formed to match joining method.

C. Steel piping less than Schedule 30 shall not be threaded.

D. Black-Steel Pipe Nipples: ASTM A733, made of ASTM A795, Schedule 40 steel pipe with threaded ends.

E. Steel Couplings: ASTM A865, threaded.

F. Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL listed.

H. Cast-Iron Flanges: ASME 16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A234/A234M and ASME B16.9.

K. Malleable Iron Fittings: ASMT B16.3, Class 150

L. Grooved-Joint, Steel-Pipe Appurtenances:

1. Pressure Rating: 175 psig minimum.
2. Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 rigid pattern, unless otherwise indicated by this specification, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.

2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated by this specification.

C. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated by this specification.

D. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.5 VALVES

A. General Requirements:

1. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:

1. Standard: UL listed, except with ball instead of disc.
2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends.
3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends.
4. Valves NPS 3 and larger: Ductile-iron body with grooved ends.

C. Bronze Butterfly Valves:

1. Pressure Rating: 175 psig
2. Body Material: Bronze.
3. End Connections: Threaded.

D. Iron Butterfly Valves:

1. Pressure Rating: 175 psig.
2. Body Material: Cast or ductile iron.
3. End Connections: Grooved.

E. Check Valves:

1. Pressure Rating: 250 psig minimum
2. Type: Swing check.
3. Body Material: 2-1/2 inches or more: Cast iron.
4. Body Material: 2 inches or less: Bronze with screw ends
5. End Connections: Flanged or grooved.

F. Bronze OS&Y Gate Valves:

1. Pressure Rating: 175 psig.
2. Body Material: Bronze.
3. End Connections: Threaded.

G. Iron OS&Y Gate Valves:

1. Pressure Rating: 250 psig minimum
2. Body Material: Cast or ductile iron.
3. End Connections: Flanged or grooved.

H. Indicating-Type Butterfly Valves:

1. Pressure Rating: 175 psig minimum.
2. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

3. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

4. Valve Operation: Integral electrical, 115-V ac, prewired, two-circuit, supervisory switch visual indicating device.

I. Indicator Posts:

1. Type: Horizontal for wall mounting.
2. Body Material: Cast iron with extension rod and locking device.
3. Operation: Hand wheel.

2.6 TRIM AND DRAIN VALVES

A. General Requirements:

1. Pressure Rating: 175 psig minimum.
2. Provide Angle Valves, Ball Valves, Globe Valves, Plug Valves

2.7 SPECIALTY VALVES

A. General Requirements:

1. Pressure Rating:

a. Standard-Pressure Piping Specialty Valves: 175 psig minimum.
b. High-Pressure Piping Specialty Valves: 250 psig minimum

2. Body Material: Cast or ductile iron.
3. Size: Same as connected piping.
4. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Design: For horizontal or vertical installation.
2. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
3. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Pressure Rating: 175 psig (1200 kPa) minimum.
2. Type: Automatic draining, ball check.
3. Size: NPS ¾ (DN 20).
4. End Connections: Threaded.

2.8 FIRE-DEPARTMENT CONNECTIONS

A. New Fire-Department Connection:

1. Type: Wall Mounted.
2. Pressure Rating: 175 psig (1200 kPa) minimum.
3. Body Material: Corrosion-resistant metal.
4. Inlets: 4" NPS Storz type. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
5. Caps: Brass, lugged type, with gasket and chain or plastic.
6. Escutcheon Plate: Round, brass, wall type.
7. Outlet: Back, with pipe threads.
8. Number of Inlets: One or as required by the AHJ.
9. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE
10. Finish: Rough chrome plated
11. Outlet Size: 4" NPS or as required by AHJ.
12. Match existing Portland Jetport Fire-Department Connections unless directed by AHJ

2.9 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Use welded, threaded or grooved outlets only.
2. Mechanical fastened tees are not permitted.
3. Where welded outlets are used, cutouts shall be fastened to the pipe from which they are cut.

B. Flow Detection and Test Assemblies:

1. Pressure Rating: 175 psig minimum
2. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
3. Size: Same as connected piping.
4. Inlet and Outlet: Threaded.

C. Sprinkler Inspector's Test Fittings:

1. Pressure Rating: 175 psig minimum.
2. Body Material: Cast- or ductile-iron housing with sight glass.
3. Size: Same as connected piping.
4. Inlet and Outlet: Threaded.

2.10 SPRINKLERS

A. General Requirements:

1. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
2. Sprinklers with O-rings are not permitted.

B. Automatic Sprinklers with Heat-Responsive Element:

1. Characteristics: Nominal ½-inch orifice with Discharge Coefficient K of 5.6(or 5.5), and 8.0 for "Ordinary" temperature classification rating unless otherwise indicated by this specification or required by application.
2. Provide ½ inch NPS thread for K5.6(or 5.5) and ¾ inch NPS thread for K8.0.

C. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

D. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel one piece, flat.

E. Sprinkler Guards:

1. Type: Wire cage with fastening device for attaching to sprinkler.

2.11 ALARM DEVICES

A. Water-Flow Indicators:

1. Water-Flow Detector: Electrically supervised.
2. Components: Two double-throw circuit switches for isolated alarm and auxiliary contacts, complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
3. Type: Paddle operated with screw terminals.
4. Pressure Rating: 250 psig.
5. Design Installation: Horizontal or vertical.
6. Time Delay Feature: from 0 to 45 seconds

B. Valve Supervisory Switches:

1. Type: Electrically supervised with screw terminals.
2. Components: Double-pole, double-throw switch with normally closed contacts.
3. Design: Signals that control valve is in other than fully open position.

C. Indicator-Post Supervisory Switches:

1. Type: Electrically supervised with screw terminals.
2. Components: Double-throw switch with normally closed contacts.
3. Design: Signals that controlled indicator-post valve is in other than fully open position.

2.12 PRESSURE GAGES

A. Type: Liquid filled

B. Dial Size: 4-1/2-inch diameter.

C. Pressure Gage Range: 0 to 250 psig minimum

D. Water System Piping Gage: Include “WATER” or “AIR/WATER” label on dial face.

2.13 PIPE ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.

B. One-Piece, Cast-Brass Escutcheons: Rough Brass finish with set-screws.

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish.

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set-screws.

E. Split-Casting, Cast-Brass Escutcheons: rough-brass finish with concealed hinge and set-screw.

F. Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge.

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

H. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.14 SLEEVES

A. Steel-Pipe Sleeves: ASTM A53/A53M, Type E, standard weight, plain ends.

2.15 HANGERS

A. Materials available by product type. Provide materials to comply with location and application requirements unless noted otherwise on drawings and schedules.

1. Pipe rings - Malleable iron, carbon steel.
2. Clevis - Carbon steel.

3. Steel pipe clamps - Carbon steel, alloy, stainless steel.
4. Socket clamps - Carbon steel.
5. Beam clamps - Malleable/ductile iron, hardened steel, carbon steel, forged steel.
6. Structural attachments - Carbon steel, malleable iron.
7. Ceiling plates/ceiling flanges - Plastic, cast iron, malleable iron.
8. Concrete inserts and attachments – Malleable iron, carbon steel; stainless steel body, fiberglass bars, polypropylene disc (iron cross design).
9. Rod attachments - Carbon steel, malleable iron, forged steel.
10. Pipe supports - Carbon steel, cast iron.
11. Pipe shields and saddles - Carbon steel, alloy steel, stainless steel.
12. Pipe rolls - Cast iron, carbon steel.
13. Guides - Carbon steel; slides, carbon steel with PTFE slide plates.
14. Engineered hangers - Carbon steel, stainless steel, chrome molybdenum steel.
15. Powder driven studs – Not permitted

B. Finishes: Provide finishes to comply with location and application requirements unless noted otherwise on drawings and schedules.

1. Electro-plating galvanizing process per ASTM B633.
2. Hot Dipped galvanizing process per ASTM A153.
3. Epoxy paint.
4. Zinc-rich paint.
5. Copper
6. Standard primer shall meet Fed Spec TT-P-636.

2.16 SIGNAGE

A. Provide aluminum signs for each valve and to identify hydraulic design. Signs shall have white lettering on a red background with holes for easy attachment. Enter pertinent data for each system on the hydraulic placard.

2.17 SPRINKLER CABINET

A. Provide metal cabinet(s) as required containing a stock of spare sprinkler heads of all types and ratings installed as well as any special tools required for removal or replacement of the heads. The number of spare sprinklers shall conform to NFPA 13. The cabinet shall be located, in an area where the temperature will not exceed 100 degrees F (38 degrees C), and approved by the AHJ.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

A. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Project Manager and Fire Protection Engineer before deviating from approved working plans.

B. Where required to be protected against damage from earthquakes, install seismic restraints on piping in accordance with NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Reductions in pipe sizes shall be made with tapered fittings, bushings shall not be permitted.

D. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. Trapeze type supports shall utilize angle iron. Use of pipe for trapeze supports is prohibited.

E. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to temperatures below 40 degrees F. Install pressure gages on both sides of every pressure reducing valve.

F. Provide a check valve at the connection to the system riser(s) at each floor connection.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated by this specification.

B. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

E. 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.

F. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to the requirements and recommendations of NFPA 13.

1. Shop weld pipe joints where welded piping is indicated. Do not weld to galvanized-steel pipe.
2. Affix cutout disks, which are created by cutting holes in the walls of pipe for flow switches and non-threaded pipe connections to the respective waterflow switch or pipe connection near to the pipe from where they were cut.

G. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

H. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

I. Copper-Tubing Grooved Joints: Roll rounded-edge groove in end of tube according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join copper tube and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND ALARM DEVICE INSTALLATION

A. Install water flow indicators and valve supervisory devices in accordance with Division 28, Addressable/Analog Fire Alarm specification.

B. All valves shall be electronically supervised.

C. Valves must be accessible from floor level, and shall not be installed above ceilings.

D. Where valves are installed above 6 ft. install chain drives.

E. Operation of valve supervisory device shall generate a supervisory signal upon no more than two complete turns of the valve wheel or a closure of 20 percent, whichever is less.

F. For OS&Y valves, provide a roll cut “U” groove in the valve stem the same size as the supervisory switch shaft.

3.5 SPRINKLER INSTALLATION

A. Temperature Rating: Install ordinary temperature sprinklers, unless modified herein the specification. Sprinklers installed in higher ambient temperature areas shall be installed in accordance with NFPA 13.

1. For sprinklers installed directly underneath skylights, install intermediate temperature sprinklers.
2. Elevator Machine Rooms: Install intermediate temperature sprinklers.
3. Emergency Generator Rooms: Install high temperature sprinklers.
4. As shown on the drawings.

B. Sprinkler Guards: Provide mechanical guards as required to prevent mechanical damage in accordance with NFPA 13, and as follows:

1. All sprinklers installed below 7 ft.
2. All sprinklers below baggage handling equipment.
3. All sprinklers installed in elevator machine rooms.
4. All sprinklers installed in electrical distribution rooms.

C. Corrosion Protection: Provide corrosion-resistant sprinklers in locations where chemicals, moisture, or other corrosive vapors sufficient to cause corrosion of such devices exist, and as follows:

1. Install corrosion-resistant sprinklers in all showers.
2. Install corrosion-resistant sprinklers in all open parking garages
3. Install corrosion-resistant sprinklers where exposed to the exterior environment.

D. Quick Response Sprinklers:

1. Install in all areas where listed for use and in accordance with NFPA 13.
2. Do not install in elevator machine rooms.

3.6 DRAINS

A. Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13.

1. All drain discharge outlets on the outside of the building shall be located no higher than 1 foot above grade level.
2. Drains provided as part of floor control valves shall discharge to an express drain located adjacent to the sprinkler riser. Drains shall be of the combination inspector's test/drain type.

3.7 SIGNAGE

A. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at each sectional control valve where there is a zone water flow switch. Where more than one sprinkler zone is provided, signs shall indicate the specific zone served by the valve.

3.8 FIRESTOPPING AND FIREPROOFING

A. Firestop all holes for 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 Division 7; Penetration Firestopping. Existing holes through which new piping for this project passes shall be totally firestopped in a manner that restores the fire protection rating of the penetrated wall, floor, ceiling or other structure.

B. Where structural fireproofing is disturbed, damaged, or destroyed as a result of the sprinkler system installation, the contractor shall be responsible for restoring the fire proofing to the required fire resistance rating in an approved manner. This restoration shall be done in accordance with the UL listing or FM approval of the fireproofing materials, requirements of the building, fire, and life safety codes in effect for the project, and in accordance with Division 7; Applied Fireproofing.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in concrete or masonry walls and floors.

B. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated by this specification.

C. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe. In seismic zones, for pipe 2½ inch and smaller install sleeves that are large enough to provide 1 inch annular clear space between sleeve and pipe, for pipe larger than 2½ inch install sleeves that are large enough to provide 2 inch annular clear space between sleeve and pipe.

D. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

E. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gauge galvanized sheet steel.

F. Escutcheon plates shall be installed where exposed piping penetrates through walls, ceilings and floors.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Hydrostatically test wet-pipe sprinkler systems, as required by NFPA 13, in the presence of the Project Manager and Fire Protection Engineer or their designated representative(s). The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary test. Test water flow alarms, tamper switches, and all other devices for smooth and correct operation. Test the water flow alarms by flowing water through the inspector's test connection. When tests are completed and corrections made, submit signed and dated “Contractor’s Material and Test Certificates” in accordance with NFPA 13, with a request for final inspection and tests.
2. Test and adjust controls. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Verify that equipment hose threads are same as local fire-department equipment.

B. Final Inspection and Testing: Advise the Project Manager and Fire Protection Engineer when hydrostatic and preliminary functional tests have been completed and all necessary corrections made, so as to permit scheduling of final inspection and testing. Submit request for testing at least fifteen (15) working days prior to planned test date. A final acceptance test will not be scheduled until operation and maintenance manuals have been received by the Project Manager and Fire Protection Engineer.

1. At the final test, a material and test certificate must be provided in accordance with NFPA 13.
2. Submit up-to-date red-lined shop drawings to the Project Manager and Fire Protection Engineer or designated representative 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. Up-to-date drawings shall be maintained on site throughout construction.
3. The final test shall, at a minimum, be witnessed by the AHJ, Project Manager, and Fire Protection Engineer. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the final test.
4. Final testing shall include, but is not limited to, full flow testing through both the main drain and the inspector's test connection as well as testing of all water flow and tamper switches.
5. Provide all equipment, services and labor to properly perform all required tests.

C. Coordination of Installation:

1. The Contractor shall coordinate this sprinkler system work with other trades to avoid conflicts and assure system completion and testing within the project schedule, and to assure a quality, workmanlike finished product. In occupied buildings the Contractor shall coordinate all work with the Jetport’s Property Manager to limit the disruptions to business and activities. This may mean altered scheduling, after hours work, and/or sequencing construction activities to avoid disruptions to Jetport operations and other occupant activities within the building.
2. Disruptions to existing automatic sprinkler systems shall be kept to a minimum or avoided. Sprinkler systems outside of the construction project shall be kept in service at all times in a method approved by the AHJ and Fire Protection Engineer.
3. Delineate phasing of construction to ensure that installations of new systems are expedited, and existing systems are kept in service until the replacement system is operational.

3.11 CLEANING AND PAINTING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Paint sprinkler pipe as required by Division 9, Painting.

END OF SECTION 21 13 13

SECTION 21 13 16 - DRY-PIPE SPRINKLER SYSTEM

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. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Sprinklers.
4. Alarm devices.
5. Pressure gages.
6. Other fire sprinkler related appurtenances

B. Related Sections:

1. Division 1 Section “Submittal Procedures”
2. Division 7, Section “Applied Fireproofing”
3. Division 9, Section “Painting”
4. Division 21 Section "Fire-Suppression Standpipes"
5. Division 21 Section "Wet-Pipe Sprinkler Systems"
6. Division 28, Section “Digital Addressable Fire Alarm Systems”

1.3 DESCRIPTION OF WORK

A. Scope: Provide a complete dry-pipe automatic sprinkler system and associated equipment, ready for operation.

B. Description of Work: This work includes providing a new dry-pipe automatic sprinkler system for the new Loading Dock that is associated with the expansion of the Portland Jetport. The systems shall include all piping, sprinklers, fittings, hangers, valves, flow switches, tamper switches, check valves, control valve with trim package, air compressor, drains, inspector’s test connections, and all other accessories and miscellaneous items required for a complete operating system, even though each item may not be specifically mentioned or described. The sprinkler system shall be tested and ready for full operation prior to acceptance by the Authority Having Jurisdiction (AHJ).

C. Compliance: The entire dry-pipe automatic sprinkler system shall be designed in accordance with this specification. Any reference to "authority(ies) having jurisdiction" shall be interpreted to mean the Maine State Fire Marshals Office and Portland Fire Department. All material and equipment used shall be listed or approved by UL, FM or another nationally recognized testing agency, for their intended use and service.

1.4 PERFORMANCE REQUIREMENTS

A. General: Design an automatic dry-pipe sprinkler system in accordance with all required and advisory provisions of NFPA 13, including all the Annexes and except where modified herein, by hydraulic calculations for the hazard occupancy shown on the drawings with uniform water distribution over the design area.

1. General Design Area Sizes and Densities

a. Provide the appropriate sprinkler design density based on the hazard classification in accordance with NFPA 13.
b. The discharge area shall be the hydraulically most demanding 1,950 sq ft or as required by NFPA 13.

B. Water Supply Information

1. Available fire-hydrant flow test records indicate the following conditions:

a. Date: September 16, 2008
b. Time: Approx. 1:00 a.m.
c. Performed by: Portland Water District
d. Location of Residual Fire Hydrant: Hydrant POD-HYD01653 (International Parkway at Existing Jetport)
e. Location of Flow Fire Hydrant: Hydrant POD-HYD01817 (340’ South of Jetport Blvd)
f. Static Pressure at Residual Fire Hydrant: 90 psig
g. Measured Flow at Flow Fire Hydrant: 2510 gpm
h. Residual Pressure at Residual Fire Hydrant: 84 psig

C. Sprinkler System Layout: Approved by the Fire Protection Engineer and AHJ.

D. Other Design Criteria:

1. Margin of Safety for Available Water Flow and Pressure: 10 percent, including losses through water-service piping, valves, and backflow preventers.
2. Maximum protection area per sprinkler shall be per NFPA 13.
3. Water shall flow from the inspector’s trip test connection within a maximum time of 60 seconds regardless of system size
4. Hot dipped galvanized (internal and external) sprinkler piping must be used for all dry-pipe sprinkler systems.
5. Interior pipe coatings are specifically prohibited where not listed for fire protection use.
6. If system volume exceeds 500 gallons, the dry pipe valve shall be provided with a quick-opening device.
7. The maximum volume of a system controlled by a single dry pipe valve shall not exceed 750 gallons.

E. Seismic Performance: As required, the sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and the building code.

1. Seismic Expansion Joints: As/If required, provide flexible piping systems of a length that exceeds the maximum design movement of seismic expansion joints. The use of 90 degree fittings in pipe as shown in NFPA 13 is specifically prohibited.

1.5 SUBMITTALS

A. Submittals to be in accordance with Division 1, Submittal Procedures unless otherwise indicated by this section.

B. Product Data: Submit four (4) bound sets of submittals for each type of product indicated to the Project Manager and Fire Protection Engineer for review and approval. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories. Partial submittals will not be acceptable and will be returned without review. Manufacturer's data shall be provided for all products listed in Part 2 of this specification and annotated to show the specific model, type and size of each item:

C. Shop Drawings: For dry-pipe sprinkler system, submit four (4) sets of drawings that include all information as required by NFPA 13 to the Project Manager and Fire Protection Engineer for review and approval. The drawings shall be prepared on uniform sized sheets not less than 30 in by 42 in (760 by 1070 mm). Partial submittals will not be acceptable and will be returned without review. Include plans, elevations, sections, details, isometric diagram of sprinkler system riser piping showing the control valve locations, and attachments to other work.

1. Layout indicating details, plan view, elevations and sections of the system piping. Indicate the location of sprinklers and piping in relation to the ceiling layout, showing pipe lengths and sizes, and calculated volume of the dry system piping.
2. Detailed riser diagram including isometric diagrams showing schematic of systems supply, supply connection, devices, valves, pipe and fittings.
3. Point-to-point electrical wiring diagrams for all alarm and supervisory devices, as well as air compressor and its associated alarms.
4. The signature and seal of a registered Professional Fire Protection Engineer, or the signature and certification number of a NICET Level III or IV Sprinkler Technician.

D. Hydraulic Calculations. Submit name of hydraulic program and comply with the following:

1. Calculations shall be performed for the hydraulically most demanding area.
2. Minimum operating pressure of any sprinkler shall be according to NFPA 13 and appropriate UL listing or FM approval.

E. Verification of Qualification. Prior to installation, submit documentation, to the Project Manager and Fire Protection Engineer, showing that the Contractor has successfully installed automatic fire suppression sprinkler systems of comparable size, type and design as specified herein or that the Contractor has a firm contractual agreement with a Subcontractor having such experience.

1. The data shall include the names and locations of at least three installations where the Contractor, or Subcontractor, installed such systems.
2. The Contractor, or Subcontractor, shall certify that each system has performed satisfactorily for a period of not less than one year.

3. The Contractor of Subcontract shall submit the NICET/PE certification/license number and expiration date.

F. As Built Drawings:

1. General: Prepare and submit four (4) sets of detailed "As-Built Drawings" to the Project Manager and Fire Protection Engineer. 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 13. The drawings shall be prepared on uniform sized sheets not less than 30 in by 42 in (760 by 1070 mm). Submit these drawings within two weeks after the final acceptance test of the system.
2. Provide two (2) sets of CAD based electronic as-built drawings to the Project Manager and Fire Protection Engineer; each set shall include DWG and DWF file formats, including all associated externally referenced electronic files (Xref's). These files shall contain externally referenced files that have been inserted (do not bind the Xref's). Provide both DWG and DWF file formats on two (2) separate recordable CD-R's (do not use CD-RW's or DVD-R/RW's). In addition, provide in each set a read only PDF copy of each As-Built drawing for archiving purposes. PDF files shall be created using the PDF Creator utility. These three (3) CD-R's shall be formatted, written to, and the recording session closed in such a manner as to prevent additional electronic file transfers to the recordable CD-R's.

G. Field Test Reports and Certificates: Submit test certification, to the Project Manager and Fire Protection Engineer, for all pipe and fittings. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

H. Operation and Maintenance Data: Not less than fifteen (15) working days prior to the final acceptance testing of the entire system, and for use during the instruction period hereinafter specified, provide three (3) bound copies of an Operation and Maintenance Manual to the Project Manager and Fire Protection Engineer. 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 description of the part. The manual shall include all data relative to alarm valves, water flow switches and tamper switches.

1.6 QUALITY ASSURANCE

A. Qualifications:

1. Layout and hydraulic calculation shall be performed by a NICET Level III or IV Technician certified in Automatic Sprinkler Systems Layout or a Registered Fire Protection Engineer.

2. Installation shall be performed by a licensed sprinkler contractor who is experienced in the layout and installation of automatic sprinkler systems (minimum 3 years) of comparable size and type.

3. Installer's responsibilities include layout, fabrication, and installation of sprinkler systems. Layout calculations shall be based on the fire-hydrant flow test data provided.

4. Drawings shall be sealed by a licensed Professional Fire Protection Engineer or be signed by a NICET Level III or IV Technician certified in Automatic Sprinkler Systems Layout.

B. Applicable References: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the latest editions of the following codes and standards:

1. National Fire Protection Association (NFPA), including all amendments and annexes
   a. NFPA 13 – Standard for the Installation of Sprinkler Systems.
   b. NFPA 70 – The National Electrical Code®
   c. NFPA 72 – The National Fire Alarm Code®
   d. NFPA 101 – The Life Safety Code®

2. Underwriter's Laboratories (UL)

   a. "Fire Protection Equipment Directory"

3. Factory Mutual Global (FM)

   a. Approval Guide

4. American Standard for Testing Materials (ASTM)

   a. ASTM A53/A53M, "Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless"
   b. ASTM A47/A47M, "Standard Specification for Ferritic Malleable Iron Castings"
   c. ASTM A153, "Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware"
   d. ASTM A536, "Standard Specification for Ductile Iron Castings"
   e. ASTM A733, "Standard Specification for Welded and Seamless Carbon Steel and Austenitic Stainless Steel Pipe Nipples"
   f. ASTM A795, "Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use"
   g. ASTM A865, "Standard Specification for Threaded Couplings, Steel, Black or Zinc-Coated (Galvanized) Welded or Seamless, for Use in Steel Pipe Joints"
   h. ASTM B633, "Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel"

5. American Water Works Association (AWWA)

   a. AWWA C110, "Standard for Ductile Iron and Gray Iron Fittings for Water"
   b. AWWA C606, "Standard for Grooved and Shouldered Joints"

6. American Society of Mechanical Engineers (ASME)

   a. ASME B1.20.1, "Pipe Threads, General Purpose"
   b. ASME B16.4, "Gray Iron Threaded Fittings"
   c. ASME B16.5, "Pipe Flanges and Flanged Fittings: NPS 1/2 through 24"
   d. ASME B16.21, "Nonmetallic Flat Gaskets for Pipe Flanges"
   e. ASME B18.2.1, "Square and Hex Bolts and Screws, Inch Series"

7. International Code Council (ICC)

    a. International Building Code (IBC)]

C. Guarantee. 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 Project Design Team, Owner, and AHJ. Final Acceptance includes, but is not limited to, the receipt of as-built drawings and operation and maintenance manuals.

D. Conflicts. The system shall be installed in accordance with the drawings, specifications, and referenced publications. Any conflicts between these documents shall be brought to the attention of the Project Manager and Fire Protection Engineer.

PART 2 - PRODUCTS

2.1 All products shall be UL listed or FM approved for Fire Protection Service unless specifically allowed otherwise by this specification.

2.2 PIPING MATERIALS

A. Materials shall be interior and exterior hot dipped galvanized steel.

2.3 STEEL PIPE AND FITTINGS

A. Schedule 40, Galvanized Steel Pipe: ASTM A795, in NPS 2 inches and smaller. Pipe ends may be factory or field formed to match joining method.

B. Schedule 10, Galvanized Steel Pipe: ASTM A795, Schedule 10 in pipe greater than NPS 2 inches. Pipe ends may be factory or field formed to match joining method.

C. Galvanized Steel Pipe Nipples: ASTM A733, made of ASTM A795, Schedule 40 steel pipe with threaded ends.

D. Galvanized Steel Couplings: ASTM A865, threaded.

E. Galvanized Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

F. Galvanized Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

G. Grooved-Joint, Galvanized Steel-Pipe Appurtenances:

1. Pressure Rating: 175 psig minimum.
2. Grooved-End Fittings for Steel Piping: ASTM A47/A47M, malleable-iron casting or ASTM A536, ductile-iron casting; with dimensions matching steel pipe.
3. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 rigid pattern, unless otherwise indicated by this specification, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.4 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flanges and Class 150, Bronze Flat-Face Flanges: Full-face gaskets.
2. Class 250, Cast-Iron Flanges and Class 300, Steel Raised-Face Flanges: Ring-type gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated by this specification.

2.5 VALVES

A. General Requirements:

1. Minimum Pressure Rating for Standard-Pressure Piping: 175 psig.

B. Ball Valves:

1. Standard: UL listed, except with ball instead of disc
2. Valves NPS 1-1/2 and Smaller: Bronze body with threaded ends
3. Valves NPS 2 and NPS 2-1/2: Bronze body with threaded ends or ductile-iron body with grooved ends
4. Valves NPS 3 and larger: Ductile-iron body with grooved ends

C. Bronze Butterfly Valves:

1. Pressure Rating: 175 psig
2. Body Material: Bronze
3. End Connections: Threaded

D. Iron Butterfly Valves:

1. Pressure Rating: 175 psig
2. Body Material: Cast or ductile iron
3. End Connections: Grooved

E. Check Valves:

1. Pressure Rating: 300 psig minimum
2. Type: Swing check
3. Body Material: 2-1/2 inches or more: Cast iron
4. Body Material: 2 inches or less: Bronze with screw ends
5. End Connections: Flanged or grooved

F. Bronze OS&Y Gate Valves:

1. Pressure Rating: 175 psig
2. Body Material: Bronze
3. End Connections: Threaded

G. Iron OS&Y Gate Valves:

1. Pressure Rating: 300 psig minimum
2. Body Material: Cast or ductile iron
3. End Connections: Flanged or grooved

H. Indicating-Type Butterfly Valves:

1. Pressure Rating: 175 psig minimum
2. Valves NPS 2 and Smaller:

   a. Valve Type: Ball or butterfly
   b. Body Material: Bronze
   c. End Connections: Threaded

3. Valves NPS 2-1/2 and Larger:

   a. Valve Type: Butterfly
   b. Body Material: Cast or ductile iron
   c. End Connections: Flanged, grooved, or wafer

4. Valve Operation: Integral electrical, 115-V ac, prewired, two-circuit, supervisory switch visual indicating device

2.6 TRIM AND DRAIN VALVES

A. General Requirements:

1. Pressure Rating: 175 psig minimum

B. Provide Angle Valves, Ball Valves, Globe Valves, Plug Valves

2.7 SPECIALTY VALVES

A. General Requirements:

1. Pressure Rating:

   a. Standard-Pressure Piping Specialty Valves: 175 psig minimum
   b. High-Pressure Piping Specialty Valves: 300 psig minimum

2. Body Material: Cast or ductile iron
3. Size: Same as connected piping
4. End Connections: Flanged or grooved

B. Dry Pipe Valve:

1. Design: Differential-pressure type
2. Include accelerators, trim sets for air supply, drain, priming level, alarm connections, ball drip valves, pressure gages, priming chamber attachment, and fill-line attachment

3. Air-Pressure Maintenance Device:

    a. Type: Automatic device to maintain minimum air pressure in piping
    b. Include shutoff valves to permit servicing without shutting down sprinkler piping, bypass valve for quick filling, pressure regulator or switch to maintain pressure, strainer, pressure ratings with 14- to 60-psig adjustable range, and 175-psig outlet pressure
    c. Provide quick-opening (accelerator) device for systems with volumes in excess of 500 gpm

4. Air Compressor:

    a. Motor Horsepower: Fractional
    b. Power: 60 Hz, single or poly phase
    c. Single-stage, oil free type, air-cooled, electric motor driven
    d. Equipped with check valve, shut-off valve, and pressure switch for automatic starting and stopping

C. Automatic (Ball Drip) Drain Valves:

1. Pressure Rating: 175 psig (1200 kPa) minimum
2. Type: Automatic draining, ball check
3. Size: NPS ¾ (DN 20)
4. End Connections: Threaded

D. Drum Drip Drain Assembly:

1. Minimum NPS 2 (DN 50) drum size

2.8 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Use welded, threaded or grooved outlets only
2. Mechanical fastened tees are not permitted
3. Where welded outlets are used, cutouts shall be fastened to the pipe from which they are cut

B. Flow Detection and Test Assemblies:

1. Pressure Rating: 175 psig minimum
2. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve
3. Size: Same as connected piping
4. Inlet and Outlet: Threaded

C. Sprinkler Inspector’s Test Fittings:

1. Pressure Rating: 175 psig minimum
2. Body Material: Cast- or ductile-iron housing with sight glass
3. Size: Same as connected piping
4. Inlet and Outlet: Threaded

2.9 SPRINKLERS

A. General Requirements:

1. Pressure Rating for Automatic Sprinklers: 175 psig minimum
2. Sprinklers with O-rings are not permitted

B. Automatic Sprinklers with Heat-Responsive Element:

1. Characteristics: Nominal ½-inch orifice with Discharge Coefficient K of 5.6(or 5.5), and 8.0 for "Ordinary" temperature classification rating unless otherwise indicated by this specification or required by application

C. Sprinkler Finishes:

1. Bronze
2. Painted

D. Special Coatings:

1. Corrosion resistant coating

2.10 ALARM DEVICES

A. Pressure Switches:

1. Type: Electrically supervised water-flow switch with retard feature
2. Components: Double-pole, double-throw switch with normally closed contacts
3. Design Operation: Rising pressure signals water flow

B. High/Low Pressure Switch

1. Type: Electrically supervised pressure switch
2. Components: Double-pole, double-throw switch with normally closed contacts
3. Design Operation: Loss of half of normal pressure to tripping point and when air pressure reaches 10 psi above normal pressure

C. Valve Supervisory Switches:

1. Type: Electrically supervised with screw terminals
2. Components: Double-pole, double-throw switch with normally closed contacts
3. Design: Signals that controlled valve is in other than fully open position

D. Indicator-Post Supervisory Switches:

1. Type: Electrically supervised with screw terminals
2. Components: Double-throw switch with normally closed contacts
3. Design: Signals that controlled indicator-post valve is in other than fully open position

2.11 PRESSURE GAGES

A. Type: Liquid filled

B. Dial Size: 4-1/2-inch diameter

C. Pressure Gage Range: 0 to 300 psig minimum

D. Water System Piping Gage: Include “WATER” or “AIR/WATER” label on dial face

2.12 PIPE ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates

B. One-Piece, Cast-Brass Escutcheons: Rough Brass finish with set-screws

C. One-Piece, Deep-Pattern Escutcheons: Deep-drawn, box-shaped brass with chrome-plated finish

D. One-Piece, Stamped-Steel Escutcheons: Chrome-plated finish with set-screws

E. Split-Casting, Cast-Brass Escutcheons: rough-brass finish with concealed hinge and set-screw

F. Split-Plate, Stamped-Steel Escutcheons: Chrome-plated finish with concealed hinge

G. One-Piece Floor Plates: Cast-iron flange with holes for fasteners

H. Split-Casting Floor Plates: Cast brass with concealed hinge

2.13 SLEEVES

A. Steel-Pipe Sleeves: ASTM A53/A53M, Type E, standard weight, plain ends

2.14 HANGERS

A Materials available by product type. Provide materials to comply with location and application requirements unless noted otherwise on drawings and schedules.

1. Pipe rings - Malleable iron, carbon steel
2. Clevis - Carbon steel
3. Steel pipe clamps - Carbon steel, alloy, stainless steel
4. Socket clamps - Carbon steel
5. Beam clamps - Malleable/ductile iron, hardened steel, carbon steel, forged steel
6. Structural attachments - Carbon steel, malleable iron
7. Ceiling plates/ceiling flanges - Plastic, cast iron, malleable iron
8. Concrete inserts and attachments – Malleable iron, carbon steel; stainless steel body, fiberglass bars, polypropylene disc (iron cross design)
9. Rod attachments - Carbon steel, malleable iron, forged steel
10. Pipe supports - Carbon steel, cast iron
11. Pipe shields and saddles - Carbon steel, alloy steel, stainless steel
12. Pipe rolls - Cast iron, carbon steel

13. Guides - Carbon steel; slides, carbon steel with PTFE slide plates
14. Engineered hangers - Carbon steel, stainless steel, chrome molybdenum steel
15. Powder driven studs – Not permitted

B. Finishes: Provide finishes to comply with location and application requirements unless noted otherwise on drawings and schedules.

1. Electro-plating galvanizing process per ASTM B633
2. Hot Dipped galvanizing process per ASTM A153
3. Epoxy paint
4. Zinc-rich paint
5. Standard primer shall meet Fed Spec TT-P-636

2.15 SIGNAGE

A. Provide aluminum signs for the control valve and to identify hydraulic design. Signs shall have white lettering on a red background with holes for easy attachment. Enter pertinent data on the hydraulic placard.

2.16 SPRINKLER CABINET

A. Provide metal cabinet(s) as required containing a stock of spare sprinkler heads of all types and ratings installed as well as any special tools required for removal or replacement of the heads. The number of spare sprinklers shall conform to NFPA 13. The cabinet shall be located, in an area where the temperature will not exceed 100 degrees F, and approved by the Project Manager and Owner.

PART 3 - EXECUTION

3.1 WATER-SUPPLY CONNECTIONS

A. Install shutoff valve**,** pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

3.2 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Project Manager and Fire Protection Engineer before deviating from approved working plans.

B. Where required to be protected against damage from earthquakes, install seismic restraints on piping in accordance with NFPA 13.

C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes. Reductions in pipe sizes shall be made with tapered fittings, bushings shall not be permitted.

D. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13. Trapeze type supports shall utilize angle iron. Use of pipe for trapeze supports is prohibited.

E. Install pressure gages on riser or feed main, at each sprinkler test connection. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to temperatures below 40 degrees F.

F. If necessary to comply with water delivery time, install accelerator quick opening device in accordance with the requirements of NFPA 13 and manufacturer's instructions.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated by this specification.

B. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

C. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

D. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

E. 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.

F. Steel Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

G. Dissimilar Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE AND ALARM DEVICE INSTALLATION

A. Connect water flow indicators and valve supervisory devices to the facility Fire Alarm Control Panel (FACP), in accordance with Division 28, Addressable Fire Alarm specification.

B. All valves shall be electronically supervised.

C. Valves must be accessible from floor level, and shall not be installed above ceilings.

D. Where valves are installed above 6 ft. install chain drives.

E. Operation of valve supervisory device shall generate a supervisory signal upon no more than two complete turns of the valve wheel or a closure of 20 percent, whichever is less.

F. For OS&Y valves, provide a roll cut "U" groove in the valve stem the same size as the supervisory switch shaft.

3.5 SPRINKLER INSTALLATION

A. Temperature Rating: Install ordinary temperature sprinklers.

B. Sprinkler Guards: Provide mechanical guards as required to prevent mechanical damage in accordance with NFPA 13, and as follows:

1. On all sprinklers installed below 7 ft.

C. Corrosion Protection: Provide corrosion-resistant sprinklers.

D. Flexible sprinkler fittings shall not be used.

3.6 DRAINS

A. Pipe drains to discharge at safe points outside of the building or to sight cones attached to drains of adequate size to readily carry the full flow from each drain under maximum pressure. Do not provide a direct drain connection to sewer system or discharge into sinks. Install drips and drains where necessary and required by NFPA 13.

1. All drain discharge outlets on the outside of the building shall be located no higher than 1 foot above grade level.
2. Provide a floor drain within the dry-pipe valve assembly room.
3. Drip drum drains are not required to be discharged to the exterior if not required to drain the piping system.

3.7 SIGNAGE

A. Securely attach identification signs to control valves, drain valves, and test valves. Locate hydraulic placard information signs at the control valve. Where more than one sprinkler zone is provided, signs shall indicate the specific zone served by the valve.

3.8 FIRESTOPPING AND FIREPROOFING

A. Firestop all holes for 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 Division 7, Firestopping. Existing holes through which new piping for this project passes shall be totally firestopped in a manner that restores the fire protection rating of the penetrated wall, floor, ceiling or other structure.

B. Where structural fireproofing is disturbed, damaged, or destroyed as a result of the sprinkler system installation, the contractor shall be responsible for restoring the fire proofing to the

required fire resistance rating in an approved manner. This restoration shall be done in accordance with the UL listing or FM approval of the fireproofing materials, requirements of the building, fire, and life safety codes in effect for the project, and in accordance with Division 7, Applied Fireproofing.

3.9 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in concrete or masonry walls and floors.

B. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated by this specification.

C. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe. In seismic zones, for pipe 2½ inch and smaller install sleeves that are large enough to provide 1 inch annular clear space between sleeve and pipe, for pipe larger than 2½ inch install sleeves that are large enough to provide 2 inch annular clear space between sleeve and pipe.

D. Sleeves in Masonry and Concrete Walls, Floors, and Roofs: Provide hot-dip galvanized steel, ductile-iron, or cast-iron sleeves. Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in the core-drilled hole are completely grouted smooth.

E. Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs: Provide 26 gauge galvanized sheet steel.

F. Escutcheon plates shall be installed where exposed piping penetrates through walls, ceilings and floors.

3.10 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Hydrostatically test the dry-pipe sprinkler system, as required by NFPA 13, in the presence of the Project Manager and/or Fire Protection Engineer or their designated representative. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the preliminary test. Test water flow alarms, tamper switches, and all other devices for smooth and correct operation. Test the water flow alarms by flowing water through the inspector's test connection. When tests are completed and corrections made, submit signed and dated “Contractor’s Material and Test Certificates” in accordance with NFPA 13, with a request for final inspection and tests.
2. Test and adjust controls. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.

B. Final Inspection and Testing: Advise the Project Manager when hydrostatic and preliminary alarm tests have been completed and all necessary corrections made, so as to permit scheduling of the final inspection and testing. Submit request for testing at least fifteen (15) calendar days prior to proposed test date. A final acceptance test WILL NOT BE SCHEDULED until

operation and maintenance manuals have been received by the Project Manager and Fire Protection Engineer.

1. At the final test, a material and test certificate must be provided in accordance with NFPA 13.
2. Submit up-to-date as-built drawings to the Project Manager and Fire Protection Engineer at the final test. These drawings shall be undamaged sets of prints of the shop drawings, with changes from the original drawings highlighted. Up-to-date drawings shall be maintained on site throughout construction.
3. The final test shall be witnessed, at a minimum, by the AHJ, Project Manager, and Fire Protection Engineer. The Contractor and an authorized representative from each supplier of equipment shall be in attendance at the final test.
4. Final testing shall include, but is not limited to full flow testing through the test fitting, as well as testing of all water flow and tamper switches.
5. Provide all equipment, services and labor to properly perform all required tests.

C Coordination of Installation:

1. The Contractor shall coordinate this sprinkler system work with other trades to avoid conflicts, assure system completion and testing within the project schedule and to assure a quality, workmanlike finished product.

3.11 CLEANING AND PAINTING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

C. Paint sprinkler pipe as required by Division 9, Painting.

END OF SECTION 21 13 16

SECTION 21 22 00 – CLEAN AGENT FIRE SUPPRESSION SYSTEMS

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Scope: This work includes providing new automatic clean agent fire suppression systems for the following rooms in the new addition within the Portland Jetport; as described herein and as shown on the contract drawings for the Portland Jetport Expansion. The systems shall include all piping, agent storage cylinders, fittings, hangers, valves, actuation (fire detection) devices, system control panels, and all other accessories and miscellaneous items required for a complete operating system, even though each item may not be specifically mentioned or described. The clean agent suppression systems shall be tested and ready for full operation prior to acceptance by the Authority Having Jurisdiction (AHJ).

1. Room 1508 – Server Room – (approx.) 74 sq.ft. x 17 feet height to slab above.
2. Room 1512 – IDF Room – (approx.) 234 sq.ft. x 11 feet height to slab above.
3. Room 2518 – MDF Room – (approx.) 300 sq. ft. x 13 feet height to slab above.
4. Room 3508 – IDF Room – (approx.) 101 sq. ft. x 8 feet height to (gypsum) ceiling.

B. Extent of Work: Provide design, shop drawings, project record drawings (as-built), equipment, fabrication, labor, transportation and supervision necessary to install, test and place into service a clean agent extinguishing system.

C. Components: System shall consist of, but not be limited to piping and nozzles, fittings, extinguishing agent, extinguishing agent containers, system control panel, wiring, detection and alarm devices, and other devices for a complete installation in accordance with codes, standards and recommended practice referenced in this Section.

1.2 QUALIFICATIONS OF INSTALLER/CONTRACTOR:

A. The system shall be installed by an experienced firm regularly engaged in the installation of automatic FM-200 fire extinguishing systems, in strict accordance with NFPA standards.

B. The contractor's firm must have a minimum of ten (10) years of experience in design, installation, and testing FM-200, or similar, fire suppression systems. A representative list of systems previously installed, of similar nature and scope, shall be provided at the time of proposal.

C. The installation Contractor shall be an authorized stocking distributor of the manufacturer for the equipment included in the system so that immediate replacement parts can be provided from inventory. Contractor shall show proof of available telephone communications on a twenty-four hour, seven-days-a-week basis; his service personnel shall be available for emergency service at all times.

D. Insurance Requirements:

1. The FM-200 systems installation Contractor shall show evidence that he carries a minimum $2,000,000.00 liability and completed operations insurance policy.

2. These limits shall supersede limits required in the general conditions of the specifications.

1.3 SYSTEM DESCRIPTION AND OPERATION

A. The system shall be total flooding FM-200 extinguishing system designed to provide a uniform concentration of 7%, at normal average ambient temperature, minimum of FM-200.

1. The amount of FM-200 to be provided shall be the amount required to obtain and hold the minimum uniform concentration for ten (10) minutes. The contractor shall take into consideration such factors as permanent openings (those that cannot be closed, if any), run-down time for fans, time required for dampers to close (and requirements for any additional dampers), and any other feature of the facility that could affect concentration.

B. The system shall be actuated by a combination of ionization and photoelectric smoke detectors. Automatic operation in each separate protected area shall be as follows:

1. Actuation of one (1) detector in either loop shall:

a. Illuminate the respective zone (circuit) lamp on the control unit.
b. Energize a pre-alarm audible or audible/visual signal associated with that area in which the detector was operated.
c. Actuate door closer/holders on access doors to the protected area.
d. Transmit a signal to the building's fire alarm system.

2. Actuation of a second detector in the same area, but on the second detection loop, shall:

a. Illuminate the respective zone (circuit) lamp on the control unit.
b. Energize an evacuation audible and visual signal associated with the area in which the detector was operated.
c. Start time-delay sequence.
d. Shut down ventilation system and/or close dampers.
e. Cause discharge of the FM-200 at the end of time-delay period. \

C. The system shall be capable of being actuated by manual discharge stations located at each fire exit from the room being protected. Operation of manual discharge station shall duplicate the cross-zones sequence description above, except that time-delay shall be bypassed. The manual discharge station shall be of the electrical actuation type and be supervised at the control panel. Local, manual, mechanical release shall be installed on each pilot cylinder. Systems that do not allow for this type of releasing shall not be permitted.

1.4 SUBMITTALS

A. Product data as specified in NFPA 2001

1. Extinguishing-agent containers.
2. Extinguishing agent.
3. Discharge nozzles.

4. Control panels.
5. Detection devices.
6. Manual-release stations.
7. Abort Stations
8. Switches.
9. Alarm devices.

B. Shop Drawings using a minimum scale of 1/8" = 1'0" for plans and 1/4" = 1'0" for details. All lettering shall be a minimum of 1/8 inch high. Include information as specified in NFPA 2001, Section 3-1.2.

1. Layout drawings detailing the location of all agent storage tanks, pipe runs including pipe sizes and lengths, control panel(s), detectors, manual pull stations, abort stations, audible and visual alarms, and all mechanical, structural, and electrical interferences.
2. Auxiliary details and information such as maintenance panels, door holders, special sealing requirements, and equipment shutdowns.
3. Separate layouts or drawings for mechanical and electrical work.
4. Separate layout or drawings showing isometric details of agent storage containers, mounting details, and proposed pipe runs and sizes.
5. Electrical layout drawings shall show the location of all devices and include point-to-point conduit runs.
6. Provide complete hydraulic (2-phase) flow calculations from a UL-listed computer program. Calculation sheets must include the manufacturer’s name and U.L. listing for verification. The individual sections of pipe and each fitting to be used, as shown on isometric drawings, must be identified and included in the calculations. Total agent discharge time must be shown and detailed by zone.
7. Submit drawings, calculations, and system component data sheets for approval before starting construction.

C. Seismic Calculations: Submit the seismic calculations required by Section 1.2 B.

1. Provide calculations based on a dynamic analysis certified by a registered professional engineer with expertise in dynamic seismic analysis. Calculate in-structure response for the system such that performance of system within structure meets the required performance category criteria in NFPA 13.

D. Catalog Data with selected options noted.

E. Materials Part List (Bill of Materials) with manufacturer, model number, and quantity.

F. Test Reports

G. Operation and Maintenance Manual: Submit system description, system final inspection and Contractor's material and test certificates per NFPA 2001, of the completed system project record documents.

1. Include in operation and maintenance manuals, instructions, a brief description of type of system installed, routine maintenance work defined by step-by-step instructions, and recommended frequency of performance.
2. Also include in instructions, possible malfunctions with diagnostic methods and suggested correction of each.
3. Describe function of each component or subassembly.

H. Project Record Drawings (As-Built): Provide updated shop drawings on CDs and prints reflecting as-built conditions showing Work completed under this Section.

1. Base as-built drawings on actual survey of the completed installation.
2. Include notes on all special systems or devices such as damper and door closure interlocks.
3. List recommended spare parts (manufacturer, model number, and quantity).

1.5 QUALITY ASSURANCE

A. Provide proof that installation firm has satisfactorily performed at least ten projects of equivalent nature and scope of the Projects herein; and is licensed within the USA to engage in design, fabrication and installation of clean agent systems for fire protection.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Materials and Equipment: Protect materials and equipment from damage during shipping, storage and installation.

B. Plugs and Cover Plates: Protect threaded ends, flanged openings with gasketed metal cover plates to prevent damage during shipment and to prevent foreign materials from entering. Cap or plug drains, vents, small piping, and gauge connections.

PART 2 PRODUCTS

2.1 DESIGN

A. Provide design documents for a new clean agent fire suppression system, including all materials and equipment, UL Listed or FM Approved, conforming to requirements of NFPA 2001.

2.2 PIPING AND FITTING MATERIALS

A. Provide in accordance with NFPA 2001.

2.3 VALVES

A. General: Brass; suitable for intended operation.

B. Container Valves: With rupture disc or solenoid, capable of immediate and total agent discharge and suitable for intended flow capacity.

C. Valves in Sections of Closed Piping and Manifolds: Fabricate to prevent entrapment of liquid, or install valve and separate pressure-relief device.

D. Valves in Manifolds: Check valve; installed to prevent loss of extinguishing agent when container is removed from manifold.

2.4 DISCHARGE NOZZLES

A. Equipment manufacturer's standard one-piece brass or aluminum alloy of type, discharge pattern, and capacity required for application.

B. Nozzles shall be available in NPT pipe sizes ¼" through 2". Each size shall be available in 180 deg and 360 deg distribution patterns.

2.5 AGENT STORAGE CONTAINERS

A. Description: Steel tanks complying with ASME Boiler and Pressure Vessel Code: Section VIII, for unfired pressure vessels. Include minimum working-pressure rating that matches system charging pressure, valve, pressure switch, and pressure gage.

1. Finish: Manufacturer's standard color, enamel or epoxy paint.
2. Manifold: Fabricate with valves, pressure switches, and connections for multiple storage containers, as indicated.
3. Storage-Tank Brackets: Factory- or field-fabricated retaining brackets consisting of steel straps and channels; suitable for container support, maintenance, and tank refilling or replacement.

B. Each container shall have a pressure gauge and low-pressure switch to provide visual and electrical supervision of the container pressure. The low-pressure switch shall be wired to the control panel to provide audible and visual “Trouble” alarm in the event the container pressure drops below 272 psig or other threshold as specified by the Manufacturer. The pressure gauge shall be color coded to provide an easy visual indication of container pressure.

C. Each container shall have a pressure relief valve that automatically operates when the internal temperature exceeds 150 deg F.

D. Containers shall be actuated by parallel-wired initiators located at each agent container.

2.6 CONTROL PANELS

A. Description: FM approved or UL listed, including equipment and features required for testing, supervising, and operating fire-extinguishing system.

B. Power Requirements: 120-VAC; with electrical contacts for connection to system components and fire alarm system, and transformer or rectifier as needed to produce power at voltage required for accessories and alarm devices.

C. Enclosure: NEMA ICS 6, Type 1, enameled-steel cabinet.

1. Mounting: Wall mounted - Surface
2. Locks for all panels shall be keyed alike.

D. Panel shall be microprocessor based and shall communicate with and control the following types of equipment used to make up the system: intelligent detectors, addressable modules, annunciators, and other system controlled devices.

E. Other control panel features

1. Electrical contacts for shutting down fans, activating dampers, and operating system electrical devices.
2. Automatic switchover to standby power at loss of primary power.
3. Connection to building’s main fire alarm control panel (FACP).

F. Standby power - Lead-acid or nickel-cadmium batteries with capacity to operate system for 60 hours and alarm for minimum of 15 minutes. Include automatic battery charger,

with varying charging rate between trickle and high depending on battery voltage, that is capable of maintaining batteries fully charged. Include manual voltage control, dc voltmeter, dc ammeter, electrical contacts for connection to control panel, and suitable enclosure.

2.7 DETECTORS

A. Description: Comply with NFPA 2001 and NFPA 72, and include the following types:

1. Photoelectric Detectors
2. Ionization Detectors

2.8 MANUAL DISCHARGE STATIONS

A. Description: FM approved or UL listed, with "PULL STATION" caption, 24-V dc compatible with controls, and red finish.

1. Shall be dual action type, SPST switch.
2. The device shall interface with the control panel and be field programmable.
3. Device shall be installed at 44 inches to center of device.
4. Manual activation shall bypass the delay and abort functions and cause all alarm and shutdown devices to operate the same as if the system has operated automatically.

2.9 ALARM/NOTIFICATION DEVICES

A. Description: FM approved or UL listed, low voltage, and surface mounting, unless otherwise indicated.

B. Horns: 90 to 94 dBA.

C. Strobe Lights: Translucent lens, with "FIRE" or similar caption.

2.10 ABORT STATIONS

A. Abort switches shall, when operated, interrupt the countdown delay for the activation of the extinguishing system and prevent the operation of any alarms and control functions associated with the discharge of the extinguishing agent. The abort switches shall be momentary, "dead-man" type devices that require a constant force to remain engaged and active. Manual releasing stations shall override the operation of any abort switch. Abort switches shall be configured for operation according to the requirements of the authority having jurisdiction.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to installation carefully inspect installed Work of other trades, whether pre-existing or part of this Project, and verify that such work is complete to the point where installation of clean agent system may start.

B. Notify the Project Manager and Fire Protection Engineer should conditions exist, not resulting from Work of this Project, that prohibits the installation from conforming to referenced codes, regulations, standards and approved design.

C. Install materials and equipment that are free of moisture, scale, corrosion, dirt and other foreign materials.

3.2 INSTALLATION

A. Install clean-agent extinguishing piping and other components level and plumb and according to manufacturers' written instructions.

B. Grooved Piping Joints: Groove pipe ends according to AWWA C606 dimensions. Assemble grooved-end steel pipe and steel, grooved-end fittings with steel, keyed couplings and lubricant according to manufacturer's written instructions.

C. Anchor extinguishing-agent containers to substrate.

D. Install pipe and fittings, valves, and discharge nozzles according to requirements listed in NFPA 2001, Section “Distribution,” and related Appendix A paragraphs; and ASME B31.1.

E. Install valves designed to prevent entrapment of liquid or install pressure-relief devices in valved sections of piping systems.

F. Support piping using supports and methods according to NFPA 13.

G. As required, install seismic restraints for extinguishing-agent containers and piping systems.

H. All piping shall be reamed, blown clear, and swabbed with suitable solvents to remove burrs, mill varnish, and cutting oils before assembly.

I. Seal male threads with Teflon tape pipe sealant applied before assembly.

J. Install control panels, detection system components, alarms, and accessories, complying with requirements of NFPA 2001, Section “Detection, Actuation, Alarm, and Control Systems,” as required for supervised system application.

K. Secure all ceiling tiles near discharge nozzles.

3.3 SIGNS:

A. Caution/Advisory Signs: Provide labeling on entrances, piping, extinguishing-agent containers, other equipment, and panels according to NFPA 2001, including:

1. Entrance sign at each entrance to a protected space.
2. Manual Discharge sign at each manual discharge station.
3. Flashing Light sign required at each flashing light over each exit from a protected space.

3.4 WIRING

A. Install wiring in electrical metallic tubing (EMT) or conduit.

B. Securely support all system components independent of the wiring. Runs of conduit and wiring shall be straight, neatly arranged, properly supported, and installed parallel and perpendicular to walls and partitions.

C. Use conductor sizes specified by the system manufacturer. Color codes shall be used. All wires shall be free from grounds and crosses between conductors.

D. Install wiring to conform to the National Electric Code for Class 1 Signal Systems, except as otherwise permitted for limited energy circuits, as described in NFPA 72.

E. Ground the complete system electrical installation and all auxiliary components in accordance with the NEC (NFPA 70).

3.5 TESTING

A. After system installation is completed, the entire system shall be checked out, inspected, and functionally tested by qualified, trained personnel, in accordance with the manufacturer's recommended procedures and NFPA 2001, Section "Approval of Installations."

B. Test containers and distribution piping for proper mounting and installation.

C. Test electrical wiring for proper connection, continuity, and resistance to ground.

D. Functionally test the complete system in the presence of the Fire Protection Engineer and Project Manager. Release of agent is not required for the test.

E. All functions, including system and equipment interlocks, must be operational at least five days prior to the final acceptance tests.

F. Notify Project Manager and Fire Protection Engineer at least ten (10) working days in advance to witness tests.

3.6 TRAINING

A. Prior to acceptance, provide operational training on the system to Portland Jetport personnel.

B. Training session shall include system control panel operation, manual and abort functions, trouble procedures, auxiliary functions, and emergency procedures.

3.7 OPERATION AND MAINTENANCE

A. Prior to final acceptance, provide four (4) copies of a complete operation and maintenance manual. The manual shall include the following:

1. All aspects of system operation and maintenance detailed, including piping isometrics, wiring diagrams of all circuits, a written description of system design and sequence of operation
2. Drawing(s) illustrating control logic
3. Equipment used in the fire suppression system
4. Checklists and procedures for emergency situations
5. Troubleshooting techniques
6. Maintenance operations and procedures

3.8 AS-BUILT DRAWINGS

A. Provide four (4) copies of system "as-built" drawings. Drawings shall include:

1. Actual equipment locations (control panels, agent containers, detectors, alarms, manual and abort switches)
2. Piping and conduit routing details
3. All room or facilities modifications

3.9 ACCEPTANCE TESTING

A. Conduct acceptance tests in the presence of the Construction Inspector/AHJ.

B. The acceptance test shall include the following:

1. Operation of the entire control system to determine it functions as designed and intended. All circuits shall be tested, including:

   a. Automatic actuation
   b. Manual actuation
   c. HVAC and power shutdowns
   d. Audible and visual alarm devices
   e. Manual override of abort functions
   f. Smoke/fire damper operation
   g. Agent container pressure supervision

2. Supervision of all panel circuits, including AC power and battery power supplies, shall be tested and qualified.

3. Conduct a room pressurization test for each protected space to determine the presence of openings that would impact concentration levels during a system activation. Conduct in accordance with NFPA 2001 requirements.

   a. If openings are discovered, coordinate the proper sealing of the protected space(s).
   b. Upon completion of repairs, conduct additional room pressurization tests, at no additional cost, until a successful test is obtained.
   c. Copies of successful test results shall be submitted to the Construction Inspector/AHJ.

END OF SECTION 21 22 00

SECTION 22 05 16 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING 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 loops and swing connections.
2. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 SUBMITTALS

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

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.

C. Welding certificates.

D. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

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. Adsco Manufacturing LLC.
    b. Advanced Thermal Systems, Inc.
    c. Flex-Hose Co., Inc.
    d. Flexicraft Industries.
    e. Flex-Weld, Inc.
    f. Hyspan Precision Products, Inc.
    g. Metraflex, Inc.
    h. Senior Flexonics Pathway.
    i. Unisource Manufacturing, Inc.
    j. U.S. Bellows, Inc.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Stud: Threaded, zinc-coated carbon steel.
    b. Expansion Plug: Zinc-coated steel.
    c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

    a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
    b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.
    c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least three pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least three pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least three pipe fittings including tee in main.

3.2 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Black-Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Galvanized-Steel Pipe: Attach with pipe hangers. Use MSS SP-69, Type 42, riser clamp welded to anchor.
3. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 22 05 16

SECTION 22 05 17 - SLEEVES AND SLEEVE SEALS FOR PLUMBING 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. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE 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. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

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. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL 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. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.

2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level.
4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

   a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
   b. Piping NPS 6: Galvanized-steel-pipe sleeves.

2. Exterior Concrete Walls below Grade:

   a. Piping Smaller Than NPS 6: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

a. Piping Smaller Than NPS 6: Sleeve-seal fittings.
b. Piping NPS 6 and Larger: Stack-sleeve fittings.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel-pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel-sheet sleeves .

END OF SECTION 22 05 17

SECTION 22 05 18 - ESCUTCHEONS FOR PLUMBING 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. Escutcheons.
2. Floor plates.

1.3 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and spring-clip fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
b. Chrome-Plated Piping: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
c. Insulated Piping: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.
h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type split-plate, stamped-steel type with concealed hinge.
j. Bare Piping in Equipment Rooms: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge.

2. Escutcheons for Existing Piping:

a. Chrome-Plated Piping: Split-casting brass type with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped-steel type with concealed hinge.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting brass type with polished, chrome-plated finish.
f. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped-steel type with concealed hinge.
g. Bare Piping in Unfinished Service Spaces: Split-plate, stamped-steel type with concealed hinge.
h. Bare Piping in Equipment Rooms: Split-plate, stamped-steel type with concealed hinge.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping: One-piece, floor-plate type.
2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 22 05 18

SECTION 22 05 23 - GENERAL-DUTY VALVES FOR PLUMBING 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. Bronze ball valves.
2. Iron, single-flange butterfly valves.
3. Bronze lift check valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron gate valves.

B. Related Sections:

1. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
2. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.
3. Division 33 water distribution piping Sections for general-duty and specialty valves for site construction piping.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle, gate, and globe valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

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. Conbraco Industries, Inc.; Apollo Valves.
c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.

i. Ball: Chrome-plated brass.
j. Port: Full.

2.3 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

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. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corporation.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Flo Fab Inc.
h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International, Inc.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

2.4 BRONZE LIFT CHECK VALVES

A. Class 125, Lift Check Valves with Bronze Disc:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.

c. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Design: Vertical flow.
d. Body Material: ASTM B 61 or ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.5 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

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. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.6 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Sure Flow Equipment Inc.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Clear or full waterway.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Gasket: Asbestos free.

2.7 IRON GATE VALVES

A. Class 125, OS&Y, Iron Gate 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. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. CWP Rating: 200 psig.

c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Disc: Solid wedge.
g. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.
2. Center-Guided and Plate-Type Check Valves: In horizontal or vertical position, between flanges.
3. Lift Check Valves: With stem upright and plumb.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service: Ball, or butterfly valves.
4. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Grooved-End Copper Tubing: Valve ends may be grooved.

3.5 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron, Single-Flange Butterfly Valves: 200 CWP, EPDM seat, aluminum-bronze disc.
2. Iron Swing Check Valves: Class 125, metal seats.
3. Iron, Center-Guided Check Valves: Class 125, metal seat.
4. Iron Gate Valves: Class 125, OS&Y.

3.6 SANITARY-WASTE VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, bronze with bronze trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Swing Check Valves: Class 125, metal seats.

END OF SECTION 22 05 23

SECTION 22 05 29 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe positioning systems.
7. Equipment supports.

B. Related Sections:

1. Division 21 fire-suppression piping Sections for pipe hangers for fire-suppression piping.
2. Division 22 Section "Expansion Fittings and Loops for Plumbing Piping" for pipe guides and anchors.
3. Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.

2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment.

1.5 SUBMITTALS

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

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

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

1. Detail fabrication and assembly of trapeze hangers.
2. Design Calculations: Calculate requirements for designing trapeze hangers.

D. Welding certificates.

1.6 QUALITY ASSURANCE

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

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

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. Allied Tube & Conduit.
    b. Cooper B-Line, Inc.
    c. Flex-Strut Inc.
    d. GS Metals Corp.
    e. Thomas & Betts Corporation.
    f. Unistrut Corporation; Tyco International, Ltd.
    g. Wesanco, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Electroplated zinc.

B. Non-MFMA Manufacturer Metal Framing Systems:

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. Anvil International; a subsidiary of Mueller Water Products Inc.

b. Empire Industries, Inc.
c. ERICO International Corporation.
d. Haydon Corporation; H-Strut Division.
e. NIBCO INC.
f. PHD Manufacturing, Inc.
g. PHS Industries, Inc.

2. Description: Shop- or field-fabricated pipe-support assembly made of steel channels, accessories, fittings, and other components for supporting multiple parallel pipes.
3. Standard: Comply with MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Coating: Zinc.

2.4 THERMAL-HANGER SHIELD INSERTS

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. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture. See Division 22 plumbing fixture Sections for requirements for pipe positioning systems for plumbing fixtures.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.

   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
b. NPS 4: 12 inches long and 0.06 inch thick.
c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Division 09 painting Sections.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

F. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

G. Use thermal-hanger shield inserts for insulated piping and tubing.

H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.

6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

M. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

N. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

O. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

P. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

Q. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 22 05 29

SECTION 22 05 33 - HEAT TRACING FOR PLUMBING 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. This Section includes snow and ice melting on roofs and in gutters and downspouts with the following electric heating cables:

1. Self-regulating, parallel resistance.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

1. Schedule heating capacity, length of cable, spacing, and electrical power requirement for each electric heating cable required.

B. Shop Drawings: For electric heating cable. Include plans, sections, details, and attachments to other work.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For electric heating cables to include in operation and maintenance manuals.

E. Warranty: Special warranty specified in this Section.

1.4 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.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace electric heating cable that fails in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SELF-REGULATING, PARALLEL-RESISTANCE HEATING CABLES

A. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings Easy Heat SR52J or a comparable product by one of the following:

1. BH Thermal Corporation.
2. Chromalox, Inc.; Wiegard Industrial Division; Emerson Electric Company.
3. Delta-Therm Corporation.
4. Nelson Heat Trace.
5. Pyrotenax; a division of Tyco Thermal Controls.
6. Raychem; a division of Tyco Thermal Controls.
7. Thermon Manufacturing Co.
8. Trasor Corp.

B. Heating Element: Pair of parallel No. 18 AWG, tinned stranded copper bus wires embedded in crosslinked conductive polymer core, which varies heat output in response to temperature along its length. Terminate with waterproof, factory-assembled nonheating leads with connectors at one end, and seal the opposite end watertight. Cable shall be capable of crossing over itself once without overheating.

C. Electrical Insulating Jacket: Flame-retardant polyolefin.

D. Cable Cover: Tinned-copper braid, and polyolefin outer jacket with UV inhibitor.

E. Maximum Operating Temperature (Power On): 150 deg F.

F. Maximum Exposure Temperature (Power Off): 185 deg F.

G. Maximum Operating Temperature: 300 deg F.

H. Capacities and Characteristics:

1. Maximum Heat Output: 10 W/ft.
2. Volts: 277 V.
3. Phase: 1.
4. Hertz: 60.

2.2 CONTROLS

A. Precipitation and Temperature Sensor for Snow Melting on Roofs and in Gutters:

1. Facility Management System will energize snow melting when outside temperature falls below 40 degrees F.

2.3 ACCESSORIES

A. Cable Installation Accessories: Fiberglass tape, heat-conductive putty, cable ties, silicone end seals and splice kits, and installation clips all furnished by manufacturer, or as recommended in writing by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and substrates to receive electric heating cables for compliance with requirements for installation tolerances and other conditions affecting performance.

1. Ensure surfaces in contact with electric heating cables are free of burrs and sharp protrusions.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATIONS

A. Install the following types of electric heating cable for the applications described:

1. Snow and Ice Melting on Roofs and in Gutters and Downspouts: Self-regulating, parallel-resistance heating cable.

3.3 INSTALLATION

A. Electric Heating Cable Installation for Snow and Ice Melting on Roofs and in Gutters and Downspouts: Install on roof and in gutters and downspouts with clips furnished by manufacturer that are compatible with roof, gutters, and downspouts.

B. Set field-adjustable switches and circuit-breaker trip ranges.

C. Protect installed heating cables, including nonheating leads, from damage.

3.4 CONNECTIONS

A. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.5 FIELD QUALITY CONTROL

A. Testing: Perform tests after cable installation but before application of coverings such as insulation, wall or ceiling construction, or concrete.

1. Test cables for electrical continuity and insulation integrity before energizing.
2. Test cables to verify rating and power input. Energize and measure voltage and current simultaneously.

B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 22 05 33

SECTION 22 05 48 - VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

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. Restraining braces and cables.

1.3 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.4 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the IBC: C.
2. Assigned Seismic Use Group or Building Category as Defined in the IBC: II.
3. Assigned Seismic Building Category as Defined in the IBC: III.

a. Component Importance Factor: 1.0.
b. Component Response Modification Factor: 2.5.
c. Component Amplification Factor: 1.0.

4. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.297.
5. Design Spectral Response Acceleration at 1-Second Period: 0.112.

1.5 SUBMITTALS

A. Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.

2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

    a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    b. Annotate to indicate application of each product submitted and compliance with requirements.

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

1. Seismic-Restraint Details:

    a. Design Analysis: To support selection and arrangement of seismic restraints. Include calculations of combined tensile and shear loads.
    b. Details: Indicate fabrication and arrangement. Detail attachments of restraints to the restrained items and to the structure. Show attachment locations, methods, and spacings. Identify components, list their strengths, and indicate directions and values of forces transmitted to the structure during seismic events. Indicate association with vibration isolation devices.
    c. Preapproval and Evaluation Documentation: By an agency acceptable to authorities having jurisdiction, showing maximum ratings of restraint items and the basis for approval (tests or calculations).

C. Coordination Drawings: Show coordination of seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and seismic restraints.

D. Welding certificates.

E. Qualification Data: For testing agency.

F. Field quality-control test reports.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.

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

D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproved by ICC-ES, or

preapproved by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 SEISMIC-RESTRAINT DEVICES

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

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; 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.

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: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

D. Restraint Cables: ASTM A 492 stainless-steel cables with end connections made of steel assemblies with thimbles, brackets, swivel, and bolts designed for restraining cable service; and with a minimum of two clamping bolts for cable engagement.

E. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

F. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

G. Bushing Assemblies for Wall-Mounted Equipment Anchorage: Assemblies of neoprene elements and steel sleeves designed for rigid equipment mountings, and matched to type and size of attachment devices used.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

J. Adhesive Anchor Bolts: Drilled-in and capsule anchor system containing polyvinyl or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

2.2 FACTORY FINISHES

A. Finish: Manufacturer's standard prime-coat finish ready for field painting.

B. Finish: Manufacturer's standard paint applied to factory-assembled and -tested equipment before shipping.

1. Powder coating on springs and housings.
2. All hardware shall be galvanized. Hot-dip galvanize metal components for exterior use.
3. Baked enamel or powder coat for metal components on isolators for interior use.
4. Color-code or otherwise mark vibration isolation and seismic-control devices to indicate capacity range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 APPLICATIONS

A. Multiple Pipe Supports: Secure pipes to trapeze member with clamps approved for application by an agency acceptable to authorities having jurisdiction.

B. Hanger Rod Stiffeners: Install hanger rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

C. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static and seismic loads within specified loading limits.

3.3 SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inches.
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

C. Install cables so they do not bend across edges of adjacent equipment or building structure.

D. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

E. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

F. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

G. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

H. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid 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. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.

5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
5. Test to 90 percent of rated proof load of device.
6. Measure isolator restraint clearance.
7. Measure isolator deflection.
8. If a device fails test, modify all installations of same type and retest until satisfactory results are achieved.

D. Prepare test and inspection reports.

END OF SECTION 22 05 48

SECTION 22 05 53 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

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. Equipment labels.
2. Pipe labels.
3. Valve tags.

1.3 SUBMITTALS

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

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.

B. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

2.3 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch letters for piping system abbreviation and 1/2-inch numbers.

1. Tag Material: Brass, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 09 Section "Interior Painting."

1. Identification Paint: Use for contrasting background.
2. Stencil Paint: Use for pipe marking.

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:

1. Domestic Water Piping:

Cold Water:

a. Background Color: Blue.
b. Letter Color: White.

Hot Water:

a. Background Color: Yellow.
b. Letter Color: Black.

2. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Blue.
b. Letter Color: White.

3.4 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.

B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

a. Cold Water: Natural.
b. Hot Water: Natural.

3. Letter Color:

a. Cold Water: Black.
b. Hot Water: Black.

END OF SECTION 22 05 53

SECTION 22 07 00 - PLUMBING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Insulation Materials:

a. Flexible elastomeric.
b. Mineral fiber.
c. Polyolefin.

2. Adhesives.
3. Sealants.
4. Factory-applied jackets.
5. Field-applied jackets.
6. Tapes.
7. Securements.

B. Related Sections include the following:

1. Division 23 Section "HVAC Insulation."

1.3 SUBMITTALS

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

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, including printed statement of VOC content.

C. Shop Drawings:

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.

3. Detail removable insulation at piping specialties, equipment connections, and access panels.
4. Detail application of field-applied jackets.
5. Detail application at linkages of control devices.
6. Detail field application for each equipment type.

D. Qualification Data: For qualified Installer.

E. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

F. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting 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 and inspecting 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.

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 size and location 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 and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

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 Part 3 schedule articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

D. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

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. Aeroflex USA Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

E. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000(Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

F. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

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. Armacell LLC; Tubolit.
    b. Nomaco Inc.; IMCOLOCK, IMCOSHEET, NOMALOCK, and NOMAPLY.
    c. RBX Corporation; Therma-cell.

2.2 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. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

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. Aeroflex USA Inc.; Aeroseal.
    b. Armacell LCC; 520 Adhesive.
    c. Foster Products Corporation, H. B. Fuller Company; 85-75.
    d. RBX Corporation; Rubatex Contact Adhesive.

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).

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 Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

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).

D. ASJ Adhesive, and FSK and PVDC 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 Products, Division of ITW; CP-82.
    b. Foster Products Corporation, H. B. Fuller Company; 85-20.
    c. ITW TACC, Division of Illinois Tool Works; S-90/80.
    d. Marathon Industries, Inc.; 225.
    e. Mon-Eco Industries, Inc.; 22-25.

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).

2.3 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Polystyrene 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 Products, Division of ITW; CP-70.
    b. Foster Products Corporation, H. B. Fuller Company; 30-45/30-46.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

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 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Childers Products, Division of ITW; CP-76-8.
    b. Foster Products Corporation, H. B. Fuller Company; 95-44.
    c. Marathon Industries, Inc.; 405.
    d. Mon-Eco Industries, Inc.; 44-05.
    e. Vimasco Corporation; 750.

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 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

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 Products, Division of ITW; CP-76.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.

4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 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.

2.5 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.

a. Sheet and roll stock ready for shop or field sizing.
b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
d. Factory-Fabricated Fitting Covers:

1) Same material, finish, and thickness as jacket.
2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
3) Tee covers.
4) Flange and union covers.
5) End caps.
6) Beveled collars.
7) Valve covers.
8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.6 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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0835.
b. Compac Corp.; 104 and 105.
c. Ideal Tape Co., Inc., an American Biltrite Company; 428 AWF ASJ.
d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. 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. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
b. Compac Corp.; 120.
c. Ideal Tape Co., Inc., an American Biltrite Company; 488 AWF.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

2.7 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Childers Products; Bands.
b. PABCO Metals Corporation; Bands.
c. RPR Products, Inc.; Bands.

2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.

1. Verify that systems and equipment to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. 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.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.

2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer 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.

3.4 PENETRATIONS

A. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. 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"irestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

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 services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. 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.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install 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 sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. 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.

4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 MINERAL-FIBER INSULATION INSTALLATION

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

3.8 POLYOLEFIN INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Seal split-tube longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install 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 polyolefin sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of polyolefin pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install cut sections of polyolefin pipe and sheet 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.
4. Secure insulation to valves and specialties, and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.9 FIELD-APPLIED JACKET INSTALLATION

A. 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.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, locations of welded

strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 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. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. 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. Flexible Elastomeric: 1/2 inch thick.
b. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.
c. Polyolefin: 1/2 inch thick.

E. Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

F. 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 the following:

a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

G. Hot Service Drains:

1. All Pipe Sizes: Insulation shall be the following:

a. Mineral-Fiber, Preformed Pipe, Type I or II: 1 inch thick.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Exposed:

1. Aluminum, Stucco Embossed: 0.024 inch thick on all piping with 7 ft. of floor or walkway.

END OF SECTION 22 07 00

SECTION 22 11 13 - FACILITY WATER DISTRIBUTION 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. This Section includes water-distribution piping and related components outside the building for combined water service and fire-service mains.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

1.3 SUBMITTALS

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

B. Shop Drawings: Temporary water systems to maintain uninterrupted water service to Portland Water District customers. Indicate route layout, materials, assemblies, dimensions, method of field assembly, and components.

C. Coordination Drawings: For piping and specialties including relation to other services in same area, drawn to scale. Show piping and specialty sizes and valves, meter and specialty locations, and elevations.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For water valves and specialties to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of the Portland Water District for both the proposed water main system and a temporary water system. Including tap connections to water mains and backflow prevention.
2. Comply with standards of the Portland Water District for potable-water-service piping, including materials, installation, testing, and disinfection. These standards are available on the Portland Water District website: www.pwd.org under Infrastructure and Development.

3. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Comply with FMG's "Approval Guide" or UL's "Fire Protection Equipment Directory" for fire-service-main products.

D. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-service-main piping for fire suppression.

E. NSF Compliance:

1. Comply with NSF 61 for materials for water-service piping and specialties for domestic water.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Preparation for Transport: Prepare valves, including fire hydrants, according to the following:

1. Ensure that valves are dry and internally protected against rust and corrosion.
2. Protect valves against damage to threaded ends and flange faces.
3. Set valves in best position for handling. Set valves closed to prevent rattling.

B. During Storage: Use precautions for valves, including fire hydrants, according to the following:

1. Do not remove end protectors unless necessary for inspection; then reinstall for storage.
2. Protect from weather. Store indoors and maintain temperature higher than ambient dew-point temperature. Support off the ground or pavement in watertight enclosures when outdoor storage is necessary.

C. Handling: Use sling to handle valves and fire hydrants if size requires handling by crane or lift. Rig valves to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

D. Deliver piping with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe-end damage and to prevent entrance of dirt, debris, and moisture.

E. Protect stored piping from moisture and dirt. Elevate above grade. Do not exceed structural capacity of floor when storing inside.

F. Protect flanges, fittings, and specialties from moisture and dirt.

1.6 PROJECT CONDITIONS

A. Interruption of Existing Water-Distribution 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 water-distribution service according to requirements indicated:

1. Notify Construction Manager, Portland Water District, and Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of water-distribution service without Construction Manager's, Portland Water District's, and Owner's written permission.
3. Notify the Portland Water District of a planned interruption of water distribution service. Do not proceed without the approval of the Portland Water District.
4. In order to maintain uninterrupted water service to Portland Water District customers, the Contractor shall provide temporary above ground water systems. The temporary water systems consist of mains, services, and fire department outlets. The above ground systems shall be installed only for the duration of deep water main replacement and removed promptly after main replacement is complete. Connections to an existing water source shall be installed and provided by the Portland Water District. All material for the temporary water systems, except as otherwise indicated, shall be supplied by the Contractor. Currently, Portland Water District has approved two manufacturers for the temporary mains and 100 psi poly tube for individual services. Only authorized Portland Water District personnel shall operate control valves attached to these systems.

1.7 COORDINATION

A. Coordinate connection to water main with Portland Water District.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

2.3 GATE VALVES

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

2.4 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Valve Boxes: Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

1. Operating Wrenches: Steel, tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

2.5 CORPORATION STOPS, CURB STOPS, AND SERVICE BOXES

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

2.6 FIRE HYDRANTS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

2.7 TEMPORARY WATER SYSTEMS APPROVED PIPE

A. Restrained Joint PVC Pressure Pipe and Fittings:

1. Certainteed Certa-Lok Yellowmine: Restrained joint PVC pressure pipe and fittings.
2. AquaMine (Victaulic Co): Restrained joint PVC pressure

PART 3 - EXECUTION

3.1 EARTHWORK

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

3.3 VALVE APPLICATIONS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

3.4 PIPING INSTALLATION

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

B. Extend water-service piping and connect to water-supply source and building-water-piping systems at outside face of building wall in locations and pipe sizes indicated.

1. Terminate water-service piping at building wall until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building-water-piping systems when those systems are installed.

C. Sleeves are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

D. Mechanical sleeve seals are specified in Division 22 Section "Sleeves and Sleeve Seals for Plumbing Piping."

E. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

F. See Division 21 Section "Water-Based Fire-Suppression Systems" for fire-suppression-water piping inside the building.

G. See Division 22 Section "Domestic Water Piping" for potable-water piping inside the building.

3.5 JOINT CONSTRUCTION

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

3.6 ANCHORAGE INSTALLATION

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

B. Anchorage, General: Install water-distribution piping with restrained joints. Anchorages and restrained-joint types that may be used include the following:

1. Concrete thrust blocks.
2. Locking mechanical joints.
3. Set-screw mechanical retainer glands.
4. Bolted flanged joints.
5. Pipe clamps and tie rods.

C. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches. Include anchorages for the following piping systems:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

D. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.7 VALVE INSTALLATION

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

3.8 FIRE HYDRANT INSTALLATION

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

3.9 CONNECTIONS

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

B. Connect water-distribution piping to existing water main. Use method as directed by the Portland Water District.

C. Connect water-distribution piping to interior domestic water and fire-suppression piping.

3.10 TEMPORARY WATER SYSTEMS

A. Temporary above ground water mains shall be installed in a manner to both protect the public water supply and to minimize customer service interruption. To allow the Portland Water District to notify it's affected customers, the Contractor shall provide the District a minimum of 5 working days notice prior to installing any temporary lines.

B. The size and approximate location of the temporary systems shall be determined by the Contractor and submitted to the Portland Water District for approval.

C. Temporary mains shall typically be installed behind sidewalks or along the edge, and within the public right-of-way. The mains shall follow a uniform straight course and shall not bow to accommodate long sections of pipe. The route of service lines installed from the mains to provide service to the Owner and City.

D. The Contractor shall follow the pipe manufacturer's installation guidelines when installing temporary systems. Additionally, an approved joint lubrication for the installation of potable water pipe shall be used on all joints prior to connecting pipe.

E. Source: The Portland Water District will provide necessary connections at fire hydrants including an approved backflow device and meter. A chlorine tap will also be provided.

3.11 FIELD QUALITY CONTROL

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times working pressure for two hours. Follow procedures as specified in the Portland Water District’s Standard Specifications.

D. Prepare reports of testing activities.

3.12 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground water-distribution piping. Locate below finished grade, directly over piping. Underground warning tapes are specified in Division 31 Section "Earth Moving."

3.13 CLEANING

A. Adhere to Portland Water District details and specifications located at www.pwd.org under Infrastructure and Development.

B. Clean and disinfect water-distribution piping as follows:

1. Purge new water-distribution piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by the Portland Water District.

C. Prepare reports of purging and disinfecting activities.

END OF SECTION 22 11 13

SECTION 22 11 16 - 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. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Encasement for piping.
3. Specialty valves.
4. Flexible connectors.
5. Water meters.

B. Related Section:

1. Division 22 Section "Facility Water Distribution Piping" for water-service piping outside the building from source to the point where water-service piping enters the building.

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.
5. Water meters.
6. Backflow preventers and vacuum breakers.
7. Water penetration systems.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Water Samples: Specified in "Cleaning" Article.

D. Coordination Drawings: For piping in equipment rooms and other congested areas, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Fire-suppression-water piping.
2. Domestic water piping.
3. HVAC hydronic piping.

E. 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 61 for potable domestic water piping and components.

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 seven 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.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

6. 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.

    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.

B. Soft Copper Tube: ASTM B 88, Type L water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
2. 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.

    b. NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber O-ring seal in each end.
    c. NPS 3 and NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber O-ring seal in each end.

2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Standard-Pattern, Mechanical-Joint Fittings: AWWA C110, ductile or gray iron.
2. Compact-Pattern, Mechanical-Joint Fittings: AWWA C153, ductile iron.

a. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end unless grooved or flanged ends are indicated.

1. Standard-Pattern, Push-on-Joint Fittings: AWWA C110, ductile or gray iron.

a. Gaskets: AWWA C111, rubber.

2. Compact-Pattern, Push-on-Joint Fittings: AWWA C153, ductile iron.

a. Gaskets: AWWA C111, rubber.

C. Plain-End, Ductile-Iron Pipe: AWWA C151.

1. Grooved-Joint, Ductile-Iron-Pipe 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) Star Pipe Products.
4) Victaulic Company.

b. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
c. Grooved-End, Ductile-Iron-Pipe Couplings: AWWA C606 for ductile-iron-pipe dimensions. Include ferrous housing sections, EPDM-rubber gaskets suitable for hot and cold water, and bolts and nuts.

2.4 PEX TUBE AND FITTINGS

A. PEX Distribution System: ASTM F 877, SDR 9 tubing.

1. Fittings for PEX Tube: ASTM F 1807, metal-insert type with copper or stainless-steel crimp rings and matching PEX tube dimensions.
2. Manifold: Multiple-outlet, plastic or corrosion-resistant-metal assembly complying with ASTM F 877; with plastic or corrosion-resistant-metal valve for each outlet.

2.5 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.

2.6 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.

2. Description:

a. Pressure Rating: 150 psig at 180 deg F.
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

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

a. Capitol Manufacturing Company.
b. Central Plastics Company.
c. EPCO Sales, Inc.
d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig.
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Kits:

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

a. Advance Products & Systems, Inc.
b. Calpico, Inc.
c. Central Plastics Company.
d. Pipeline Seal and Insulator, Inc.

2. Description:

a. Nonconducting materials for field assembly of companion flanges.
b. Pressure Rating: 150 psig.
c. Gasket: Neoprene or phenolic.
d. Bolt Sleeves: Phenolic or polyethylene.
e. Washers: Phenolic with steel backing washers.

E. Dielectric Couplings:

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. Calpico, Inc.
b. Lochinvar Corporation.

2. Description:

a. Galvanized-steel coupling.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Female threaded.
d. Lining: Inert and noncorrosive, thermoplastic.

F. Dielectric Nipples:

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. Perfection Corporation; a subsidiary of American Meter Company.
b. Precision Plumbing Products, Inc.
c. Victaulic Company.

2. Description:

a. Electroplated steel nipple complying with ASTM F 1545.
b. Pressure Rating: 300 psig at 225 deg F.
c. End Connections: Male threaded or grooved.
d. Lining: Inert and noncorrosive, propylene.

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

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 and Smaller: Threaded copper pipe or plain-end copper tube.
3. End Connections NPS 2-1/2 and Larger: Flanged copper alloy.

2.8 WATER METERS

A. Compound-Type Water Meters:

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

a. ABB.
b. Badger Meter, Inc.
c. Master Meter, Inc.
d. Mueller Company; Water Products Division.
e. Schlumberger Limited; Water Division.
f. Sensus Metering Systems.
g. Neptune Technology Group.

2. Description:

a. Standard: AWWA C702.
b. Pressure Rating: 150-psig working pressure.
c. Body Design: With integral mainline and bypass meters; totalization meter.
d. Registration: In cubic feet as required by utility company.

e. Case: Bronze.
f. Pipe Connections: Flanged.

B. Remote Registration System: Direct-reading type complying with AWWA C706; modified with signal transmitting assembly, low-voltage connecting wiring, and remote register assembly as required by utility company. Tie into Facility Management System.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 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.

B. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

D. Install shutoff valve immediately upstream of each dielectric fitting.

E. Install domestic water piping level and plumb.

F. Install seismic restraints on piping. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

G. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

H. 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.

I. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

J. Install piping adjacent to equipment and specialties to allow service and maintenance.

K. Install piping to permit valve servicing.

L. 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.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install PEX piping with loop at each change of direction of more than 90 degrees.

P. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

Q. Install thermostats in hot-water circulation piping. Comply with requirements in Division 22 Section "Domestic Water Pumps" for thermostats.

R. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

S. 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."

T. 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."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 22 Section "Escutcheons for Plumbing Piping."

3.3 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," "Brazed Joints" Chapter.

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. 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.

G. Ductile-Iron-Piping Grooved Joints: Cut groove end of pipe. Assemble coupling with housing, gasket, lubricant, and bolts. Join ductile-iron pipe and grooved-end fittings according to AWWA C606 for ductile-iron-pipe, cut-grooved joints.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

I. PEX Piping Joints: Join according to ASTM F 1807.

J. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 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 ball valves for piping NPS 2 and smaller. Use butterfly for piping NPS 2-1/2 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 are specified in Division 22 Section "Domestic Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

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.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flange kits.

3.6 WATER METER INSTALLATION

A. Rough-in domestic water piping for water meter installation according to utility company's requirements.

B. Water meters will be furnished and installed by utility company.

C. Install water meters according to AWWA M6, utility company's requirements, and the following:

D. Install displacement-type water meters with shutoff valve on water-meter inlet. Install valve on water-meter outlet and valved bypass around meter unless prohibited by authorities having jurisdiction.

E. Install turbine-type water meters with shutoff valve on water-meter inlet. Install valve on water-meter outlet and valved bypass around meter unless prohibited by authorities having jurisdiction.

F. Install compound-type water meters with shutoff valves on water-meter inlet and outlet and on valved bypass around meter. Support meters, valves, and piping on brick or concrete piers.

G. Install fire-service water meters with shutoff valves on water-meter inlet and outlet and on full-size valved bypass around meter. Support meter, valves, and piping on brick or concrete piers.

H. Install remote registration system according to standards of utility company and of authorities having jurisdiction.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment" for seismic-restraint devices.

B. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" 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 and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install vinyl-coated hangers for PEX piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

H. Install hangers for vertical PEX piping every 48 inches.

I. Support piping and tubing not listed in this article according to MSS SP-69 and manufacturer's written instructions.

3.8 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. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. 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.
4. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.9 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.

3.10 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:

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 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.

3.11 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.12 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 of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    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.

3.13 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. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Mechanical-joint, ductile-iron pipe; standard-pattern mechanical-joint fittings; and mechanical joints.
2. Push-on-joint, ductile-iron pipe; standard-pattern push-on-joint fittings; and gasketed joints.
3. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

D. Aboveground domestic water piping, NPS 2 and smaller, shall be one of the following:

1. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.
2. Hard copper tube, ASTM B 88, Type L wrought-copper solder-joint fittings; and soldered joints.
3. PEX Tube, NPS 1 and smaller; fittings for PEX tube; and crimped joints.

E. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be the following:

1. Hard copper tube, ASTM B 88, Type L] [ASTM B 88, Type M; wrought-copper solder-joint fittings; and soldered joints.

F. Aboveground, combined domestic-water-service and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

3.14 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 ball for piping NPS 2 and smaller. Use butterfly, ball, or gate valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use ball valves for piping NPS 2 and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

END OF SECTION 22 11 16

SECTION 22 11 19 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Strainers.
6. Hose stations.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water hammer arresters.
11. Trap-seal primer valves.

B. Related Sections include the following:

1. Division 22 Section "Domestic Water Piping" for water meters.
2. Division 22 Section "Emergency Plumbing Fixtures" for water tempering equipment.
3. Division 22 Section "Drinking Fountains and Water Coolers" for water filters for water coolers.

1.3 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig, unless otherwise indicated.

1.4 SUBMITTALS

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

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

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. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

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

a. Ames Co.
b. Cash Acme.
c. Watts Industries, Inc.; Water Products Div.
d. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1001.
3. Size: NPS 1/4 to NPS 3, as required to match connected piping.
4. Body: Bronze.
5. Inlet and Outlet Connections: Threaded.
6. Finish: Rough bronze.

2.2 BACKFLOW PREVENTERS

A. Reduced-Pressure-Principle Backflow Preventers:

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. Conbraco Industries, Inc.
b. FEBCO; SPX Valves & Controls.
c. Zurn Plumbing Products Group; Wilkins Div.

2. Standard: ASSE 1013.

3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle 1/3 of flow range.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 and larger.
6. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
7. Configuration: Designed for horizontal, straight through flow.
8. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet ofNPS 2 and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 and larger.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.3 BALANCING VALVES

A. Memory-Stop Balancing Valves:

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

    a. Conbraco Industries, Inc.
    b. Crane Co.; Crane Valve Group; Crane Valves.
    c. Crane Co.; Crane Valve Group; Jenkins Valves.
    d. Crane Co.; Crane Valve Group; Stockham Div.
    e. Hammond Valve.
    f. Milwaukee Valve Company.
    g. NIBCO INC.
    h. Red-White Valve Corp.

2. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
3. Pressure Rating: 400-psig minimum CWP.
4. Size: NPS 2 or smaller.
5. Body: Copper alloy.
6. Port: Standard or full port.
7. Ball: Chrome-plated brass.
8. Seats and Seals: Replaceable.
9. End Connections: Solder joint or threaded.
10. Handle: Vinyl-covered steel with memory-setting device.

2.4 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Manifold, Thermostatic, Water-Mixing-Valve Assemblies:

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. Powers; a Watts Industries Co.
    b. Symmons Industries, Inc.

2. Description: Factory-fabricated, exposed-mounting, thermostatically controlled, water-mixing-valve assembly in two-valve parallel arrangement.
3. Large-Flow Parallel: Thermostatic water mixing valve and downstream pressure regulator with pressure gages on inlet and outlet.
4. Small-Flow Parallel: Thermostatic water mixing valve.
5. Thermostatic Mixing Valves: Comply with ASSE 1017. Include check stops on hot- and cold-water inlets and shutoff valve on outlet.
6. Water Regulator(s): Comply with ASSE 1003. Include pressure gage on inlet and outlet.
7. Component Pressure Ratings: 125 psig minimum, unless otherwise indicated.
8. Thermostatic Mixing Valve and Water Regulator Finish: Rough bronze.
9. Piping Finish: Copper.

2.5 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum, unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller;flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Perforation Size:

    a. StrainersNPS 2 and Smaller: 0.020 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.

6. Drain: Factory-installed, hose-end drain valve.

2.6 HOSE STATIONS

A. Manufacturers: Subject to compliance with requirements, provide product by the following:

1. GNY Equipment, LLC.

B. Single-Temperature-Water Hose Stations: HR-1

1. Cabinet: 30A stainless-steel double wall with polyboard insulation enclosure with valve handle, hose connection, and hose reel.
2. Hose-Reel Material: Stainless steel, discs, aluminum drum, bronze piping.
3. Mounting: Wall.
4. Supply Fitting: NPS 1 inch ball valve and double check valve.
5. Light: 100 watt with switch.
6. Hose Reel Rewind: ½ HP – 115v – 1ph – 60 HZ motor.
7. Cabinet Heater: 1600 watt – 115v – 1 ph – 60 HZ.
8. Hose: Manufacturer's standard, for service fluid, temperature, and pressure; 200 feet long.
9. Nozzle: Quick connect.
10. Vacuum Breaker: Integral or factory-installed, 1 inch dual check valve/backflow preventer.

2.7 HOSE BIBBS

A. Hose Bibbs HB:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Chrome or nickel plated.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

2.8 WALL HYDRANTS

A. Nonfreeze Wall Hydrants NFHB:

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

    a. Josam Company.
    b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    c. Tyler Pipe; Wade Div.
    d. Watts Drainage Products Inc.
    e. Woodford Manufacturing Company.
    f. Zurn Plumbing Products Group; Light Commercial Operation.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.21.3M for exposed-outlet, self-draining wall hydrants.
3. Pressure Rating: 125 psig.
4. Operation: Loose key.
5. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
6. Inlet: NPS 3/4 or NPS 1.
7. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
8. Box: Deep, flush mounting with cover.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Stainless Steel.
11. Operating Keys(s): Two with each wall hydrant.

2.9 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

B. Stop-and-Waste Drain Valves:

1. Standard: MSS SP-110 for ball valves or MSS SP-80 for gate valves.
2. Pressure Rating: 200-psig minimum CWP or Class 125.
3. Size: NPS 3/4.
4. Body: Copper alloy or ASTM B 62 bronze.
5. Drain: NPS 1/8 side outlet with cap.

2.10 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

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

a. AMTROL, Inc.
b. Josam Company.
c. MIFAB, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Metal bellows.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.11 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

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

a. MIFAB, Inc.

b. PPP Inc.
c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

2. Standard: ASSE 1018.
3. Pressure Rating: 125 psig minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.

E. Install Y-pattern strainers for water on supply side of each control valve, solenoid valve.

F. Install hose stations with check stops or shutoff valves on inlets and with thermometer on outlet.

1. Install shutoff valve on outlet if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified. Install 2-by-4-inch fire-retardant-treated-wood blocking wall reinforcement between studs. Fire-retardant-treated-wood blocking is specified in Division 06 Section "Rough Carpentry."

G. Install water hammer arresters in water piping according to PDI-WH 201.

H. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 LABELING AND IDENTIFYING

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Reduced-pressure-principle backflow preventers.
2. Manifold, thermostatic, water-mixing-valve assemblies.
3. Hose stations.
4. Supply-type, trap-seal primer valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.5 ADJUSTING

A. Set field-adjustable flow set points of balancing valves.

B. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION 22 11 19

SECTION 22 13 13 - FACILITY SANITARY SEWERS

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. Non-pressure and pressure pipe and fittings.
2. Nonpressure and pressure couplings.
3. Expansion joints and deflection fittings.
4. Cleanouts.
5. Manholes.

1.3 SUBMITTALS

A. Product Data: For all products of this section.

B. Shop Drawings: For manholes. Include plans, elevations, sections, details, and frames and covers.

C. Coordination Drawings: Show pipe sizes, locations, and elevations. Show other piping in same trench and clearances from sewer system piping. Indicate interface and spatial relationship between manholes, piping, and proximate structures.

D. Profile Drawings: Show system piping in elevation. Draw profiles to horizontal scale of not less than 1 inch equals 50 feet and to vertical scale of not less than 1 inch equals 5 feet. Indicate manholes and piping. Show types, sizes, materials, and elevations of other utilities crossing system piping.

E. Product Certificates: For each type of pipe and fitting, from manufacturer.

F. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Do not store plastic pipe and fittings in direct sunlight.

B. Protect pipe, pipe fittings, and seals from dirt and damage.

C. Handle manholes according to manufacturer's written rigging instructions.

1.5 PROJECT CONDITIONS

A. Interruption of Existing Sanitary Sewerage 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 Construction Manager and Owner no fewer than two days in advance of proposed interruption of service.
2. Do not proceed with interruption of service without Construction Manager's and Owner's written permission.

PART 2 - PRODUCTS

2.1 PVC PRESSURE SEWER PIPE AND FITTINGS

A. Pipe: AWWA C900, PVC pipe with bell-and-spigot ends for gasketed joints.

B. Fittings: AWWA C90, PVC pipe with bell ends.

C. Gaskets: ASTM F 477, elastomeric seals.

2.2 POLYETHYLENE PRESSURE SEWER PIPE AND FITTINGS

A. Polyethylene 6-inch nominal diameter DI size, DR11, 160 psi, shall be made from high density, extra high molecular weight compound equaling a PE 3408 designation and shall conform to ASTM 1248 and ASTM 3350; with a cell classification of 34534C.

B. Polyethelene DI size, DR11, 160 psi fittings 1/2-inch through 8-inch shall be injection molded from polyethelene resin PE 3408 and meet the applicable requirements of ASTM D 2513. In addition, butt fittings must meet the requirements of ASTM D 3261 while socket fittings will conform to ASTM D 2683. All fittings shall have the same pressure rating as the system piping.

C. Grip Rings: Roma grip or approved equal.

D. Join pipe and fittings using heat fusion process in accordance with pipe and fitting manufacturer's requirements.

E. Join polyethylene pipe to ductile iron pipe with a DI size polyethylene MJ adapter complying with AWWA C901, 906, and grip ring.

2.3 DUCTILE IRON PRESSURE PIPE AND FITTINGS FOR USE AT TERMINOUS MANHOLE

A. ANSI A21.51 (AWWA C151) Class 50 ductile iron pipe material, fittings ductile iron ANSI A21.53 (AWWA C153). Pipe and fittings lined with cement, standard thickness in accordance with ANSI A21.4 (AWWA C104). End joints mechanical conforming to AWWA Specification recommendations for below grade piping.

B. Mechanical Joints: Employ tapered rubber or armored gaskets forced home into a tapered groove by a cast-iron follower. High strength cast-iron bolts and nuts pulled up using a torque wrench which will not permit unequal stresses in bolts. Torque not to exceed pipe and bolt manufacturer's recommendations.

C. Restrain joints using ROMA grip rings or approved equal.

2.4 PVC GRAVITY SEWER PIPE AND FITTINGS

A. PVC Gravity Sewer Piping:

1. Pipe: ASTM D 3034, SDR 35, PVC Type PSM sewer pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM D 3034, PVC with bell ends.
3. Gaskets: ASTM F 477, elastomeric seals.

2.5 NONPRESSURE-TYPE TRANSITION COUPLINGS

A. Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition coupling, for joining underground nonpressure piping. Include ends of same sizes as piping to be joined and corrosion-resistant-metal tension band and tightening mechanism on each end.

B. 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.

C. Unshielded, Flexible Couplings:

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. Dallas Specialty & Mfg. Co.
    b. Fernco Inc.
    c. Logan Clay Pipe.
    d. Mission Rubber Company; a division of MCP Industries, Inc.
    e. NDS.
    f. Plastic Oddities; a division of Diverse Corporate Technologies, Inc.

2. Description: Elastomeric sleeve with stainless-steel shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.

D. Shielded, Flexible Couplings:

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 Mfg.
    b. Dallas Specialty & Mfg. Co.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

E. Ring-Type, Flexible Couplings:

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. Fernco Inc.
    b. Logan Clay Pipe.
    c. Mission Rubber Company; a division of MCP Industries, Inc.

2. Description: Elastomeric compression seal with dimensions to fit inside bell of larger pipe and for spigot of smaller pipe to fit inside ring.

F. Nonpressure-Type, Rigid Couplings:

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. ANACO-Husky.

2. Description: ASTM C 1461, sleeve-type, reducing- or transition-type mechanical coupling, molded from ASTM C 1440, TPE material; with corrosion-resistant-metal tension band and tightening mechanism on each end.

2.6 PRESSURE-TYPE PIPE 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.
2. Dresser, Inc.
3. Ford Meter Box Company, Inc. (The); Pipe Products Div.
4. JCM Industries, Inc.
5. Romac Industries, Inc.
6. Smith-Blair, Inc.; a Sensus company.
7. Victaulic Depend-O-Lok, Inc.
8. Viking Johnson.

B. Tubular-Sleeve Couplings: AWWA C219, with center sleeve, gaskets, end rings, and bolt fasteners.

C. Metal, bolted, sleeve-type, reducing or transition coupling, for joining underground pressure piping. Include 200-psig minimum pressure rating and ends of same sizes as piping 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.

2.7 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C 478, precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section, as required to prevent flotation.
4. Base Section: 6-inch minimum thickness for floor slab and 5-inch minimum thickness for walls and base riser section; with separate base slab or base section with integral floor.
5. Riser Sections: 5-inch minimum thickness, of length to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated; with top of cone of size that matches grade rings.
7. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
9. Two coats of dampproofing on exterior of all components.
10. Steps: Individual FRP steps or FRP ladder; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
11. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
12. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.
13. Brick Channels: Concrete or masonry fill with shelf and invert made of sewer brick.

B. Designed Precast Concrete Manholes:

1. Description: ASTM C 913; designed according to ASTM C 890 for A-16 (ASSHTO HS20-44), heavy-traffic, structural loading; of depth, shape, and dimensions indicated, with provision for sealant joints.

2. Ballast: Increase thickness of one or more precast concrete sections or add concrete to manhole as required to prevent flotation.
3. Joint Sealant: ASTM C 990, bitumen or butyl rubber.
4. Resilient Pipe Connectors: ASTM C 923, cast or fitted into manhole walls, for each pipe connection.
5. Steps: Individual FRP steps or FRP ladder; wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12-inch intervals. Omit steps if total depth from floor of manhole to finished grade is less than 48 inches.
6. Adjusting Rings: Interlocking HDPE rings, with level or sloped edge in thickness and diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
7. Grade Rings: Reinforced-concrete rings, 6- to 9-inch total thickness, with diameter matching manhole frame and cover, and with height as required to adjust manhole frame and cover to indicated elevation and slope.

C. Manhole Frames and Covers:

1. Description: Ferrous; 24-inch ID by 5-inch riser, with 4-inch- minimum-width flange and 24-inch- diameter cover. Include indented top design with lettering cast into cover, using wording equivalent to "SANITARY SEWER."
2. Material: ASTM A 536, Grade 60-40-18 ductile or ASTM A 48/A 48M, Class 35 gray iron unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Excavating, trenching, and backfilling are specified in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewer piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.

B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements.

C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.

D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.

E. Install gravity-flow, nonpressure, sewer piping according to the following:

1. Install piping pitched down in direction of flow, at minimum slope of as specified on the plans.
2. Install PVC gravity sewer piping according to ASTM D 2321 and ASTM F 1668.

F. Install force-main, pressure piping according to the following:

1. Install PVC pressure piping with restrained joints at tee fittings and at horizontal and vertical changes in direction. Use corrosion-resistant rods, pipe or fitting manufacturer's proprietary restraint system, or cast-in-place-concrete supports or anchors.
2. Install PVC pressure piping according to AWWA M23 or to ASTM D 2774 and ASTM F 1668.
3. Install and join polyethylene pressure pipe and fittings in accordance with manufacturer's recommendations.

G. Clear interior of piping and manholes of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed. Place plug in end of incomplete piping at end of day and when work stops.

3.3 PIPE JOINT CONSTRUCTION

A. Join gravity-flow, nonpressure, sewer piping according to the following:

1. Join PVC gravity sewer piping according to ASTM D 2321 and ASTM D 3034 for elastomeric-seal joints or ASTM D 3034 for elastomeric-gasket joints.
2. Join dissimilar pipe materials with nonpressure-type, flexible or rigid couplings.

B. Join force-main, pressure piping according to the following:

1. Join PVC pressure piping according to AWWA M23 for gasketed joints.
2. Join polyethylene pipe and fittings using heat fusion process in accordance with manufacturer's recommendations.
3. Join polyethylene pipe with DI size polyethylene MJ adapter complying with AWWA C901, 906, and grip ring.
4. Join dissimilar pipe materials with pressure-type couplings.

C. Pipe couplings, expansion joints, and deflection fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

1. Use nonpressure flexible couplings where required to join gravity-flow, nonpressure sewer piping unless otherwise indicated.
2. Use pressure pipe couplings for force-main joints.

3.4 MANHOLE INSTALLATION

A. General: Install manholes complete with appurtenances and accessories indicated.

B. Install precast concrete manhole sections with sealants according to ASTM C 891.

C. Form continuous brick channels and benches between inlets and outlet.

D. Set tops of frames and covers 1/8-inch below finished surface of manholes that occur in pavements. Set tops flush with finish surface elsewhere unless otherwise indicated.

3.5 CLEANOUT INSTALLATION

A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Install piping so cleanouts open in direction of flow in sewer pipe.

3.6 CONNECTIONS

A. Connect nonpressure, gravity-flow sewer piping to building's sanitary building waste lines specified in Division 22 Section "Sanitary Waste and Vent Piping."

B. Connect force-main piping to existing sanitary force mains and proposed force main where indicated on Drawings.

C. Make connections to piping and underground manholes.

1. Use commercially manufactured wye fittings for piping branch connections.
2. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
3. Protect existing piping and manholes to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

D. Connect to grease oil and sand interceptors specified in Division 22 Section "Sanitary Waste Interceptors."

3.7 CLOSING ABANDONED SANITARY SEWER SYSTEMS

A. Abandoned Piping: Close open ends of abandoned underground piping that remain in place. Include closures strong enough to withstand hydrostatic and earth pressures that may result after ends of abandoned piping have been closed. Use either procedure below:

1. Close open ends of piping with at least 8-inch-thick, brick masonry bulkheads.
2. Close open ends of piping with threaded metal caps, plastic plugs, or other acceptable methods suitable for size and type of material being closed. Do not use wood plugs.

B. Abandoned Manholes: Excavate around manhole as required and use either procedure below:

1. Remove manhole and close open ends of remaining piping.
2. Remove top of manhole down to at least 36 inches below final grade. Fill to within 12 inches of top with stone, rubble, gravel, or compacted dirt. Fill to top with concrete.

C. Backfill to grade according to Division 31 Section "Earth Moving."

3.8 IDENTIFICATION

A. Materials and their installation are specified in Division 31 Section "Earth Moving." Arrange for installation of green warning tapes directly over piping and at outside edges of underground manholes.

1. Use detectable warning tape over ferrous piping.
2. Use detectable warning tape over nonferrous piping and over edges of underground manholes.

3.9 FIELD QUALITY CONTROL

A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

1. Submit separate report for each system inspection.
2. Defects requiring correction include the following:

    a. Alignment: Less than full diameter of inside of pipe is visible between structures.
    b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
    c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
    d. Infiltration: Water leakage into piping.
    e. Exfiltration: Water leakage from or around piping.

3. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
4. Reinspect and repeat procedure until results are satisfactory.

B. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.

1. Do not enclose, cover, or put into service before inspection and approval.
2. Test completed piping systems according to requirements of authorities having jurisdiction.
3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
4. Submit separate report for each test.
5. Air test PVC gravity sewer piping according to ASTM F 1417.
6. Force Main Pressure Sewer Tests: Use hydrostatic test as follows:

    a. Fill force main with water from the low end and expel all air at the high end.
    b. Pressurize to 1.5 times the normal operating pressure but not less than 60 psi.
    c. Measure leakage over a 2-hour test period.
    d. Acceptable Leakage: Less than 10 gallons per day per inch diameter per mile of pipe tested.

7. Manholes: Perform hydraulic test according to ASTM C 969.

C. Leaks and loss in test pressure constitute defects that must be repaired.

D. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.10 CLEANING

A. Clean dirt and superfluous material from interior of structures and piping. Flush with potable water.

END OF SECTION 22 13 13

SECTION 22 13 16 - 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. This Section includes the following for soil, waste, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.
3. Encasement for underground metal piping.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. EPDM: Ethylene-propylene-diene terpolymer rubber.

C. LLDPE: Linear, low-density polyethylene plastic.

D. NBR: Acrylonitrile-butadiene rubber.

E. PE: Polyethylene plastic.

F. PVC: Polyvinyl chloride plastic.

G. TPE: Thermoplastic elastomer.

1.4 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. Sanitary Sewer, Force-Main Piping: 50 psig.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall be capable of withstanding the effects of seismic events determined according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures."

1.5 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Shop Drawings:

1. Design Calculations: Signed and sealed by a qualified professional engineer for selecting seismic restraints.
2. Sovent Drainage System: Include plans, elevations, sections, and details.

D. Field quality-control inspection and test reports.

1.6 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; "NSF-drain" for plastic drain piping; "NSF-tubular" for plastic continuous waste piping; and "NSF-sewer" for plastic sewer piping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 PIPING MATERIALS

A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 74, Service and Extra-Heavy class(es).

B. Gaskets: ASTM C 564, rubber.

C. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.

2.4 HUBLESS CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. Sovent Stack Fittings: ASME B16.45 or ASSE 1043, hubless, cast-iron aerator and deaerator drainage fittings.

C. Shielded Couplings: ASTM C 1277 assembly of metal shield or housing, corrosion-resistant fasteners, and rubber sleeve with integral, center pipe stop.

1. Standard, Shielded, Stainless-Steel Couplings: CISPI 310, with stainless-steel corrugated shield; stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Fernco, Inc.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2. Heavy-Duty, Shielded, Stainless-Steel Couplings: With stainless-steel shield, stainless-steel bands and tightening devices, and ASTM C 564, rubber sleeve.

a. Manufacturers:

1) ANACO.
2) Clamp-All Corp.
3) Ideal Div.; Stant Corp.
4) Mission Rubber Co.
5) Tyler Pipe; Soil Pipe Div.

2.5 PVC PIPE AND FITTINGS

A. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.

B. Solvent Cement and Adhesive Primer:

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. 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).

2.6 SPECIAL PIPE FITTINGS

A. Flexible, Nonpressure Pipe Couplings: Comply with ASTM C 1173, elastomeric, sleeve-type, reducing or transition pattern. Include shear ring, ends of same sizes as piping to be joined, and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Dallas Specialty & Mfg. Co.
b. Fernco, Inc.
c. Logan Clay Products Company (The).
d. Mission Rubber Co.
e. NDS, Inc.
f. Plastic Oddities, Inc.

2. Sleeve Materials:

a. For Cast-Iron Soil Pipes: ASTM C 564, rubber.
b. For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
c. For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

B. Shielded Nonpressure Pipe Couplings: ASTM C 1460, elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.

1. Manufacturers:

a. Cascade Waterworks Mfg. Co.
b. Mission Rubber Co.

2.7 ENCASEMENT FOR UNDERGROUND METAL PIPING

A. Description: ASTM A 674 or AWWA C105, high-density, crosslaminated PE film of 0.004-inch or LLDPE film of 0.008-inch minimum thickness.

B. Form: Sheet or tube.

C. Color: Black or natural.

PART 3 - EXECUTION

3.1 EXCAVATION

A. Refer to Division 31 Section "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

A. Aboveground, soil and waste piping NPS 4 and smaller shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

B. Aboveground, soil and waste piping NPS 5 and larger shall be the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

C. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

D. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
3. Dissimilar Pipe-Material Couplings: Shielded, nonpressure pipe couplings for joining dissimilar pipe materials with small difference in OD.

E. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

F. Underground, soil and waste piping NPS 5 and larger shall be the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Hubless cast-iron soil pipe and fittings; standard, shielded, stainless-steel couplings; and hubless-coupling joints.

G. 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.

3.3 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 22 Section "Facility Sanitary Sewers."

B. Basic piping installation requirements are specified in Division 22 Section "Common Work Results for Plumbing."

C. Install seismic restraints on piping. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

D. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

E. Install cleanout fitting with closure plug inside the building in sanitary force-main piping.

F. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

1. Install encasement on underground piping according to ASTM A 674 or AWWA C105.

G. 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 2 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.

H. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

I. 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; 1 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 or level if oversized.

J. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

K. Install PVC vent piping according to ASTM D 2665.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

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."

3.4 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section "Common Work Results for Plumbing."

B. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

C. Join hubless cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-coupling joints.

D. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

E. PVC Nonpressure Piping Joints: Join piping according to ASTM D 2665.

3.5 VALVE INSTALLATION

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

B. Shutoff Valves: Install shutoff valve on each sewage pump discharge.

1. Install gate or full-port ball valve for piping NPS 2 and smaller.

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

3.6 HANGER AND SUPPORT INSTALLATION

A. Seismic-restraint devices are specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Install individual, straight, horizontal piping runs according to the following:

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.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Install supports according to Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."

D. Support vertical piping and tubing at base and at each floor.

E. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch minimum rods.

F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6: 60 inches with 3/4-inch rod.
5. NPS 8 to NPS 12: 60 inches with 7/8-inch rod.

G. Install supports for vertical cast-iron soil piping every 15 feet.

H. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.

I. Install supports for vertical copper tubing every 10 feet.

J. 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.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.

K. Install supports for vertical PVC piping every 48 inches.

L. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 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. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

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.
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

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.

3.10 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION 22 13 16

SECTION 22 13 19 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Floor drains.
3. Miscellaneous sanitary drainage piping specialties.

1.3 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene plastic.

B. FOG: Fats, oils, and greases.

C. FRP: Fiberglass-reinforced plastic.

D. HDPE: High-density polyethylene plastic.

E. PE: Polyethylene plastic.

F. PP: Polypropylene plastic.

G. PVC: Polyvinyl chloride plastic.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

1.6 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

B. Coordinate size and location of roof penetrations.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Metal Cleanouts:

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

a. Josam Company; Josam Div.
b. MIFAB, Inc.
c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
d. Tyler Pipe; Wade Div.
e. Watts Drainage Products Inc.
f. Zurn Plumbing Products Group; Specification Drainage Operation.
g. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
3. Size: Same as connected drainage piping
4. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Closure: Stainless-steel plug with seal.

B. Metal Floor Cleanouts FCO:

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

a. Josam Company; Josam Div.
b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
c. Zurn Plumbing Products Group; Light Commercial Operation.
d. Zurn Plumbing Products Group; Specification Drainage Operation.
e. Josam Company; Josam Div.
f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
g. Josam Company; Blucher-Josam Div.

2. Standard: ASME A112.36.2M for threaded, adjustable housing cleanout.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule: Cast iron.

6. Outlet Connection: Inside calk.
7. Closure: Brass plug with tapered threads.
8. Adjustable Housing Material: Cast iron with threads.
9. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
10. Frame and Cover Shape: Round.
11. Top Loading Classification: Heavy Duty.
12. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.
13. Standard: ASME A112.3.1.
14. Size: Same as connected branch.
15. Housing: Stainless steel.
16. Closure: Stainless steel with seal.
17. Riser: Stainless-steel drainage pipe fitting to cleanout.

C. Cast-Iron Wall Cleanouts WCO:

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

   a. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   c. Tyler Pipe; Wade Div.
   d. Watts Drainage Products Inc.
   e. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.36.2M. Include wall access.
3. Size: Same as connected drainage piping.
4. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
5. Closure: Countersunk or raised-head, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains FD:

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. Josam Company; Josam Div.
   b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.

2. Standard: ASME A112.6.3. See Plan Schedule.
3. Pattern: See Plan Schedule.
4. Body Material: See Plan Schedule.
5. Seepage Flange: See Plan Schedule.
6. Anchor Flange: See Plan Schedule.
7. Clamping Device: See Plan Schedule.
8. Outlet: See Plan Schedule.
9. Sediment Bucket: See Plan Schedule.
10. Top or Strainer Material: See Plan Schedule.

11. Top of Body and Strainer Finish: See Plan Schedule.
12. Top Shape: See Plan Schedule.
13. Dimensions of Top or Strainer: See Plan Schedule.
14. Top Loading Classification: See Plan Schedule.
15. Funnel: See Plan Schedule.
16. Inlet Fitting: See Plan Schedule.
17. Trap Material: See Plan Schedule.
18. Trap Pattern: See Plan Schedule.
19. Trap Features: See Plan Schedule.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Expansion Joints:

1. Standard: ASME A112.21.2M.
2. Body: Cast iron with bronze sleeve, packing, and gland.
3. End Connections: Matching connected piping.
4. Size: Same as connected soil, waste, or vent piping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

F. Install deep-seal traps on floor drains and other waste outlets, if indicated.

G. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

H. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

I. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

J. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

K. Install wood-blocking reinforcement for wall-mounting-type specialties.

L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

SECTION 22 13 29 - 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. Submersible sewage pumps.
2. Packaged, submersible sewage-pump units.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles. 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.

PART 2 - PRODUCTS

2.1 SUBMERSIBLE SEWAGE PUMPS

A. Submersible, Quick-Disconnect, Double-Seal Sewage Pumps:

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; Flyte 35DX12G4JC or approved equal.

2. Description: Factory-assembled and -tested sewage-pump unit with guide-rail supports.
3. Pump type: Submersible, end-suction, single-stage, close-coupled, overhung-impeller, centrifugal sewage pump as defined in HI 1.1-1.2 and HI 1.3.
4. Pump Casing: Cast iron, with open inlet, and discharge fittings for connection to guide-rail support.
5. Impeller: Statically and dynamically balanced, ASTM B 584, cast bronze, nonclog, open, or semiopen design for solids handling, and keyed and secured to shaft.
6. Pump and Motor Shaft: Stainless steel, with factory-sealed, grease-lubricated ball bearings.
7. Seals: Mechanical.
8. Moisture-Sensing Probe: Internal moisture sensor and moisture alarm.
9. 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.

    a. Motor Housing Fluid: Air.

10. Controls:

    a. Enclosure: NEMA 4.
    b. Switch Type: Pedestal-mounted float switch with float rods and rod buttons.
    c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
    d. Float Guides: Pipe or other restraint for floats and rods in basins of depth greater than 60 inches.
    e. High-Water Alarm: Cover-mounted, compression-probe alarm, with electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

11. Controls:

    a. Enclosure: NEMA 4; pedestal mounted.
    b. Switch Type: Mechanical-float or Pressure type, in NEMA 250, Type 6 enclosures with mounting rod and electric cables.

c. Automatic Alternator: Start pumps on successive cycles and start multiple pumps if one cannot handle load.
d. High-Water Alarm: Rod-mounted, NEMA 250, Type 6 enclosure with mechanical-float, mercury-float, or pressure switch matching control and electric bell; 120-V ac, with transformer and contacts for remote alarm bell.

12. Control-Interface Features:

a. Remote Alarm Contacts: For remote alarm interface.
b. Building Automation System Interface: Auxiliary contacts in pump controls for interface to building automation system and capable of providing the following:

1) On-off status of pump.
2) Alarm status.

13. Guide-Rail Supports:

a. Standard: SWPA's "Submersible Sewage Pumping Systems (SWPA) Handbook."
b. Guide Rails: Vertical pipes or structural members, made of galvanized steel or other corrosion-resistant metal, attached to baseplate and basin sidewall or cover.
c. Baseplate: Corrosion-resistant metal plate, attached to basin floor, supporting guide rails and stationary elbow.
d. Pump Yoke: Motor-mounted or casing-mounted yokes or other attachments for aligning pump during connection of flanges.
e. Movable Elbow: Pump discharge-elbow fitting with flange, seal, and positioning device.
f. Stationary Elbow: Fixed discharge-elbow fitting with flange that mates to movable-elbow flange and support attached to baseplate.
g. Lifting Cable: Stainless steel; attached to pump and cover at manhole.

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors.

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: Comply with manufacturer guidelines.

B. Equipment Mounting: Comply with requirements for concrete base specified in Division 03 Section "Cast-in-Place Concrete or Miscellaneous Cast-in-Place Concrete."

1. Minimum Deflection: 1/4 inch.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Comply with requirements for vibration isolation devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

1. Minimum Deflection: 1/4 inch.

D. Equipment Mounting: Install progressing-cavity sewage pumps on vibration isolation equipment base.

E. Wiring Method: Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

F. 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.

3.4 CONNECTIONS

A. Comply with requirements of applicable codes.

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

END OF SECTION 22 13 29

SECTION 22 14 23 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Roof drains.
2. Cleanouts.
3. Channel drainage systems.

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 METAL ROOF DRAINS

A. Cast-Iron, Large-Sump, General-Purpose Roof Drains RD-1:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron
4. Dimension of Body: Nominal 14-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Require.
6. Flow-Control Weirs: Required.
7. Outlet: Bottom.

8. Dome Material: Cast iron.
9. Perforated Gravel Guard: Not required.
10. Vandal-Proof Dome: Not required.
11. Water Dam: Not required.

B. Cast-Iron, Medium-Sump, General-Purpose Roof Drains P/S RD

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Zurn Plumbing Products Group; Specification Drainage Operation.

2. Standard: ASME A112.6.4, for general-purpose roof drains.
3. Body Material: Cast iron.
4. Dimension of Body: 8- to 12-inch diameter.
5. Combination Flashing Ring and Gravel Stop: Required.
6. Flow-Control Weirs: Required.
7. Outlet: Bottom Side.
8. Dome Material: Cast iron.
9. Vandal-Proof Dome: Not required.
10. Secondary Drain, Strainer required.

C. Metal, Parapet Roof Drains RD-2

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.

2. Standard: ASME A112.6.4, for parapet roof drains.
3. Body Material: Cast iron.
4. Outlet: Back.
5. Grate Material: Cast iron.
6. Vandal-Proof Grate: Not required.

2.2 CLEANOUTS

A. Floor Cleanouts: FCO

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.

2. Standard: ASME A112.36.2M, for threaded, adjustable housing cleanouts.
3. Size: Same as connected branch.
4. Type: Threaded, adjustable housing.
5. Body or Ferrule Material: Cast iron.

6. Clamping Device: Not required.
7. Outlet Connection: Inside calk.
8. Closure: Brass plug with tapered threads.
9. Adjustable Housing Material: Cast iron with threads.
10. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
11. Frame and Cover Shape: Round.
12. Top-Loading Classification: Heavy Duty.
13. Riser: ASTM A 74, Service class, cast-iron drainage pipe fitting and riser to cleanout.

B. Wall Cleanouts: WCO

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Josam Company.
   b. Smith, Jay R. Mfg. Co.

2. Standard: ASME A112.36.2M, for cleanouts. Include wall access.
3. Size: Same as connected drainage piping.
4. Body Material: Hubless, cast-iron soil-pipe test tee as required to match connected piping.
5. Closure: Countersunk, drilled-and-threaded brass plug.
6. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
7. Wall Access: Round, flat, chrome-plated brass or stainless-steel cover plate with screw.
8. Wall Access: Round, nickel-bronze, copper-alloy, or stainless-steel wall-installation frame and cover.

2.3 CHANNEL DRAINAGE SYSTEMS

A. Narrow, Sloped-Invert, Polymer-Concrete, Channel Drainage Systems:

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. ABT, Inc.
   b. ACO USA.
   c. Mea-Josam Div.; Josam Company.
   d. MultiDrain Systems.
   e. Poly-Cast.
   f. Smith, Jay R. Mfg. Co.

2. Type: Modular system of channel sections, grates, and appurtenances; designed so grates fit into channel recesses without rocking or rattling.

   a. Channel Sections: Narrow, interlocking-joint, sloped-invert, polymer-concrete modular units with end caps. Include rounded bottom, with built-in invert slope of 0.6 percent and with outlets in number, sizes, and locations indicated. Include extension sections necessary for required depth.

1) Dimensions: 4-inch inside width. Include number of units required to form total lengths indicated.
2) Frame: Galvanized steel or gray iron for grates.

b. Grates: Manufacturer's designation "heavy duty," with slots or perforations, and of width and thickness that fit recesses in channel sections.

1) Material: Galvanized steel or Gray iron Stainless steel.
2) Locking Mechanism: Manufacturer's standard device for securing grates to channel sections.

c. Supports, Anchors, and Setting Devices: Manufacturer's standard unless otherwise indicated.
d. Channel-Section Joining and Fastening Materials: As recommended by system manufacturer.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions. Roofing materials are specified in Division 07 Sections.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout covers at exposed bottom of conductors where they spill onto grade.

C. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical soil and waste stack.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

G. Assemble channel drainage system components according to manufacturer's written instructions. Install on support devices so that top will be flush with adjacent surface.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 14 23

SECTION 22 34 00 - FUEL-FIRED, DOMESTIC-WATER HEATERS

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. Commercial, gas- and oil-fired, domestic-water heaters.
2. Domestic-water heater accessories.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Commercial domestic-water heaters shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

1.4 SUBMITTALS

A. Product Data: For each type and size of domestic-water heater indicated. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. LEED Submittal:

1. Product Data for Prerequisite EA 2: Documentation indicating that units comply with ASHRAE/IESNA 90.1, Section 7, "Service Water Heating."

C. Shop Drawings:

1. Wiring Diagrams: For power, signal, and control wiring.

D. Seismic Qualification Certificates: For fuel-fired, domestic-water heaters, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

E. Product Certificates: For each type of commercial, gas- and oil-fired, domestic-water heater, from manufacturer.

F. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

G. Source quality-control reports.

H. Field quality-control reports.

I. Operation and Maintenance Data: For fuel-fired, domestic-water heaters to include in emergency, operation, and maintenance manuals.

J. Warranty: Sample of special warranty.

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. ASHRAE/IESNA 90.1 Compliance: Fabricate and label fuel-fired, domestic-water heaters to comply with ASHRAE/IESNA 90.1.

C. ASME Compliance:

1. Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Where ASME-code construction is indicated, fabricate and label commercial, finned-tube, domestic-water heaters to comply with ASME Boiler and Pressure Vessel Code: Section IV.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61, "Drinking Water System Components - Health Effects."

1.6 COORDINATION

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

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of fuel-fired, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including storage tank and supports.
b. Faulty operation of controls.
c. Deterioration of metals, metal finishes, and other materials beyond normal use.

2. Warranty Periods: From date of Substantial Completion.

a. Commercial, Gas- and Oil-Fired, Domestic-Water Heaters:

1) Storage Tank: Three years.
2) Burner: One year(s).
3) Controls and Other Components: One years.

b. Compression Tanks: Five years.

PART 2 - PRODUCTS

2.1 COMMERCIAL, GAS- AND OIL-FIRED, DOMESTIC-WATER HEATERS

A. Description: Comply with ANSI Z21.10.3/CSA 4.3 or UL 732 requirements appropriate for dual-fuel, gas- and oil-fired, domestic-water heaters.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. PVI Industries, LLC.
2. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
3. State Industries.

C. Storage-Tank Construction: ASME-code steel with 150-psig minimum working-pressure rating.

1. Tappings: Factory fabricated of materials compatible with tank. Attach tappings to tank before testing.

a. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
b. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges and according to ASME B16.24 for copper and copper-alloy flanges.

2. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
3. Lining: Glass complying with NSF 61 barrier materials for potable-water tank linings, including extending lining into and through tank fittings and outlets.

D. Factory-Installed Storage-Tank Appurtenances:

1. Anode Rod: Replaceable magnesium.
2. Dip Tube: Required unless cold-water inlet is near bottom of tank.
3. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.

4. Insulation: Comply with ASHRAE/IESNA 90.1.
5. Jacket: Steel with enameled finish.
6. Temperature Control: Adjustable thermostat.
7. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.

E. Fuel Burner:

1. Standards: Combination gas-and-oil burner assembly, complying with appropriate requirements of UL 795; or comply with UL 296 for oil burners for No. 2 fuel oil and UL 795 for natural-gas fuel.
2. Safety Control: Automatic, high-temperature-limit cutoff device or system.
3. Vent Connection: According to standards of authorities having jurisdiction for dual-fuel, domestic-water heaters.

F. Capacity and Characteristics:

1. Capacity: 212 gal..
2. Recovery: 654 gph at 100 deg F temperature rise.
3. Temperature Setting: 140 deg F.
4. Fuel Gas Demand: 650 cfh.
5. Fuel Gas Input: 650,000 Btu/h.
6. Gas Pressure Regulator:

    a. Capacity: 650 cfh.
    b. Inlet Pressure: 2 psig water column.
    c. Gas Pressure Required at Burner: 11 inches water column.

7. Fuel-Oil Demand: 4.6 gpm.
8. Fuel-Oil Input: 650,000 Btu/h.
9. Electrical Characteristics:

    a. Burner Horsepower: 3/4.
    b. Volts: 120.
    c. Phase: Single.
    d. Hertz: 60.

10. Minimum Vent Diameter: 8 inches.

2.2 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Compression Tanks:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. AMTROL Inc.

b. Flexcon Industries.
c. Honeywell International Inc.
d. Pentair Pump Group (The); Myers.
e. Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
f. State Industries.

2. Description: Steel, pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
b. Interior Finish: Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

a. Working-Pressure Rating: 100 psig.
b. Capacity Acceptable: See Plan Schedule.
c. Air Precharge Pressure: See Plan Schedule.

B. Heat-Trap Fittings: ASHRAE 90.2.

C. Gas Shutoff Valves: ANSI Z21.15/CSA 9.1-M, manually operated. Furnish for installation in piping.

D. Gas Pressure Regulators: ANSI Z21.18/CSA 6.3, appliance type. Include 2-psig pressure rating as required to match gas supply.

E. Automatic Gas Valves: ANSI Z21.21/CSA 6.5, appliance, electrically operated, on-off automatic valve.

F. Combination Temperature-and-Pressure Relief Valves: Include relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select relief valves with sensing element that extends into storage tank.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
2. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

G. Pressure Relief Valves: Include pressure setting less than domestic-water heater working-pressure rating.

1. Gas-Fired, Domestic-Water Heaters: ANSI Z21.22/CSA 4.4-M.
2. Oil-Fired, Domestic-Water Heaters: ASME rated and stamped.

H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4-M.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect assembled domestic-water heaters and storage tanks specified to be ASME-code construction, according to ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters and storage tanks to minimum of one and one-half times pressure rating before shipment.

C. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Domestic-Water Heater Mounting: Install commercial domestic-water heaters on concrete base. Comply with requirements for concrete base specified in Division 03 Section “Miscellaneous Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install commercial domestic-water heaters with seismic-restraint devices. Comply with requirements for seismic-restraint devices specified in Division 22 Section "Vibration and Seismic Controls for Plumbing Piping and Equipment."

C. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend commercial-water-heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

D. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Division 22 Section "Domestic Water Piping Specialties."

E. Install thermometer on outlet piping of domestic-water heaters. Comply with requirements for thermometers specified in Division 22 Section "Meters and Gages for Plumbing Piping."

F. Install piping-type heat traps on inlet and outlet piping of domestic-water heater storage tanks without integral or fitting-type heat traps.

G. Fill domestic-water heaters with water.

H. Charge domestic-water compression tanks with air.

3.2 CONNECTIONS

A. Comply with requirements for domestic-water piping specified in Division 22 Section "Domestic Water Piping."

B. Comply with requirements for fuel-oil piping specified in Division 23 Section "Facility Fuel-Oil Piping."

C. Comply with requirements for gas piping specified in Division 23 Section "Facility Natural-Gas Piping."

D. Drawings indicate general arrangement of piping, fittings, and specialties.

E. Where installing piping adjacent to fuel-fired, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 IDENTIFICATION

A. Identify system components. Comply with requirements for identification specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.4 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.
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 operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Domestic-water heaters will be considered defective if they do not pass tests and inspections. Comply with requirements in Division 01 Section "Quality Requirements" for retesting and

reinspecting requirements and Division 01 Section "Execution" for requirements for correcting the Work.

C. Prepare test and inspection reports.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain, commercial, gas- and oil-fired, domestic-water heaters.

END OF SECTION 22 34 00

SECTION 22 40 00 - 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 lavatories showers and sinks.
2. Flushometers.
3. Toilet seats.
4. Protective shielding guards.
5. Fixture supports.
6. Water closets.
7. Urinals.
8. Lavatories.
9. Commercial sinks.
10. Individual showers.
11. Kitchen sinks.
12. Utility sinks.

B. Related Sections include the following:

1. Division 10 Section "Toilet, Bath, and Laundry Accessories."
2. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers, floor drains, and specialty fixtures not included in this Section.
3. Division 22 Section "Emergency Plumbing Fixtures."
4. Division 22 Section "Drinking Fountains and Water Coolers."

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.

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. LEED Submittal:

1. Product Data for Credit WE 3.1: Documentation indicating flow and water consumption requirements.

C. Shop Drawings: Diagram power, signal, and control wiring.

D. Operation and Maintenance Data: For plumbing fixtures to include in emergency, operation, and maintenance manuals.

E. 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. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Plastic Laundry Trays: ANSI Z124.6.
3. Plastic Shower Enclosures: ANSI Z124.2.
4. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
5. Stainless-Steel Residential Sinks: ASME A112.19.3.
6. Vitreous-China Fixtures: ASME A112.19.2M.
7. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

H. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

I. Comply with the following applicable standards and other requirements specified for shower faucets:

1. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
2. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Brass Waste Fittings: ASME A112.18.2.
4. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

K. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Flexible Water Connectors: ASME A112.18.6.
3. Floor Drains: ASME A112.6.3.
4. Grab Bars: ASTM F 446.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Off-Floor Fixture Supports: ASME A112.6.1M.
7. Pipe Threads: ASME B1.20.1.
8. Plastic Shower Receptors: ANSI Z124.2.
9. Plastic Toilet Seats: ANSI Z124.5.
10. Supply and Drain Protective Shielding Guards: ICC A117.1.
11. Whirlpool Bathtub Equipment: UL 1795.

1.6 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 10 percent of amount of each type and size installed.
2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.
3. Flushometer Valve, Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than 12 of each type.
4. Provide hinged-top wood or metal box, or individual metal boxes, with separate compartments for each type and size of extra materials listed above.
5. Toilet Seats: Equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 LAVATORY FAUCETS

A. Lavatory 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. Zurn Plumbing Products Group; Commercial Brass Operation.

2. Description: Electronic valve. 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: 0.5 gpm.

d. Centers: Single hole.
e. Mounting: Deck, concealed.
f. Valve Handle(s): Not applicable.
g. Inlet(s): NPS 3/8 tubing, plain end.
h. Spout: Rigid type.
i. Spout Outlet: Spray, 0.5 gpm.
j. Operation: Sensor.
k. Drain: Grid.
l. Tempering Device: Thermostatic.

2.2 SHOWER FAUCETS

A. Shower Faucets, P-7:

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. Chicago Faucets.
   b. Moen, Inc.
   c. Symmons Industries, Inc.

2. Description: Single-handle pressure-balance valve. Include hot- and cold-water indicators; check stops; and shower head, arm, and flange. Coordinate faucet inlets with supplies and outlet with diverter valve.

   a. Body Material: Solid brass.
   b. Finish: Stainless Steel.
   c. Maximum Flow Rate: 2.5 gpm, unless otherwise indicated.
   d. Diverter Valve: Not required.
   e. Mounting: Exposed.
   f. Antiscald Device: Integral with mixing valve.
   g. Check Stops: Check-valve type, integral with or attached to body; on hot- and cold-water supply connections.
   h. Supply Connections: NPS 1/2.
   i. Shower Head Type: Ball joint and head integral with mounting flange.
   j. Shower Head Material: Metallic with chrome-plated finish.
   k. Spray Pattern: Adjustable.
   l. Integral Volume Control: Required.

2.3 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. Eljer.
   b. Grohe America, Inc.
   c. Moen, Inc.

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: 1.5 gpm, unless otherwise indicated.
    d. Mixing Valve: Two-lever handle.
    e. Backflow Protection Device for Hose Outlet: Not required.
    f. Centers: 8 inches.
    g. Mounting: Deck, concealed.
    h. Handle(s): Wrist blade, 4 inches.
    i. Inlet(s): NPS 1/2 female shank.
    j. Spout Type: Swivel gooseneck.
    k. Spout Outlet: Aerator.
    l. Vacuum Breaker: Not required.
    m. Drain: Lift and turn.

2.4 FLUSHOMETERS

A. Flushometers, P-1, P-1A, P-2, P-2A:

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. Zurn Plumbing Products Group; Commercial Brass Operation.
    b. TOTO USA, Inc.

2. Description: Flushometer for urinal and water-closet-type fixture. Include brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, copper or brass tubing, and polished chrome-plated finish on exposed parts.

    a. Internal Design: Diaphragm operation.
    b. Style: Concealed.
    c. Inlet Size:
    d. Trip Mechanism: Hard-wired, electric-sensor actuator.
    e. Consumption: See Plan Schedule.
    f. Concealed valve and piping.

2.5 TOILET SEATS

A. Toilet Seats, P-1 & P-1A:

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. Bemis Manufacturing Company.

c. Church Seats.

2. Description: Toilet seat for water-closet-type fixture.

a. Material: Molded, solid plastic with antimicrobial agent.
b. Configuration: Open front without cover.
c. Size: Elongated.
d. Hinge Type: SC, self-sustaining, check.
e. Class: Heavy-duty commercial.
f. Color: White.

2.6 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers, P-3B:

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.

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.

2.7 FIXTURE SUPPORTS

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

1. Josam Company.
2. MIFAB Manufacturing Inc.
3. Smith, Jay R. Mfg. Co.
4. Zurn Plumbing Products Group; Specification Drainage Operation.

B. Water-Closet Supports, See Fixture Schedule on Drawing:

1. Description: Combination carrier designed for accessible and standard mounting height of wall-mounting, water-closet-type fixture. Include single or double, vertical or horizontal, hub-and-spigot or hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

C. Urinal Supports, See Fixture Schedule on Drawing:

1. Description: Type II, urinal carrier with hanger and bearing plates for wall-mounting, urinal-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

D. Lavatory Supports, See Fixture Schedule on Drawing:

1. Description: Type II, lavatory carrier with concealed arms and tie rod for wall-mounting, lavatory-type fixture. Include steel uprights with feet.
2. Accessible-Fixture Support: Include rectangular steel uprights.

2.8 SHOWER RECEPTORS

A. Shower Receptors, P-7:

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. Crane Plumbing, L.L.C./Fiat Products.
   b. LASCO Bathware.
   c. Kohler Co.

2. Description: FRP base for built-up-type shower fixture.

   a. Type: Standard, residential.
   b. Size: 36 by 36 inches.
   c. Color: White.
   d. Outlet: Drain with NPS 2 outlet.

2.9 WATER CLOSETS

A. Water Closets, P-1, P-1A:

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. Crane Plumbing, L.L.C./Fiat Products.
   b. Kohler Co.

2. Description Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.

   a. Style: One piece.

      1) Bowl Type: Elongated with siphon-jet design.
      2) Design Consumption: 1.28 gal./flush.
      3) Trip Mechanism: Electronic actuator.
      4) Color: White.

b. Supply: NPS 1 chrome-plated brass or copper with wheel-handle stop.
c. Style: Flushometer valve.

1) Bowl Type: Elongated with siphon-jet design.
2) Design Consumption: 1.28 gal./flush.
3) Color: White.

d. Flushometer: See Fixture Schedule on Drawing.
e. Toilet Seat: See Fixture Schedule on Drawing.
f. Fixture Support: Water-closet support combination carrier. See Fixture Schedule on Drawing.

2.10 URINALS

A. Urinals, P-2, P-2A:

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. Crane Plumbing, L.L.C./Fiat Products.
b. Kohler Co.

2. Description: Wall-mounting, back-outlet, vitreous-china fixture designed for flushometer valve operation.

a. Type: Blowout with extended shields.
b. Strainer or Trapway: Open trapway with integral trap.
c. Design Consumption: 0.5 gal./flush.
d. Color: White.
e. Supply Spud Size: NPS 1-1/4.
f. Outlet Size: NPS 2.
g. Flushometer: See Fixture Schedule on Drawings.
h. Fixture Support: See Fixture Schedule on Drawings.

2.11 LAVATORIES

A. Lavatories, P-3B:

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. Kohler Co.
b. Crane Plumbing, L.L.C./Fiat Products.

2. Description: Wall-mounting, vitreous-china fixture.

a. Type: With back.
b. Size: 20 by 18 inches rectangular.
c. Faucet Hole Punching: One hole.

d. Faucet Hole Location: Top.
e. Pedestal: Not required.
f. Color: White.
g. Faucet: See Plan Schedule.
h. Supplies: NPS 3/8 chrome-plated copper with stops.
i. Drain: Grid.
j. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated, cast-brass P-trap; NPS 1-1/2, 0.045-inch- thick tubular brass waste to wall; and wall escutcheon.
k. Protective Shielding Guard(s).
l. Fixture Support: Lavatory carrier.

B. Lavatories, P-3:

1. Specified under Section 06650, “Solid Polymer Fabrication.”

2. Description: Undercounter-mounting, solid-surface fixture.

a. Faucet: Lavatory Electronic for separate drain.
b. Supplies: NPS 3/8 chrome-plated copper with stops.
c. Drain: Grid.

d. Drain Piping: NPS 1-1/4 by NPS 1-1/2 chrome-plated, cast-brass P-trap; NPS 1-1/2, 0.045-inch-thick tubular brass waste to wall; and wall escutcheon.

2.12 COMMERCIAL SINKS

A. Commercial Sinks, P-8:

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. Advance Tabco.
b. Just Manufacturing Company.

2. Description: One-compartment, counter-mounting, stainless-steel commercial sink with backsplash.

a. Overall Dimensions: 25” x 22”.
b. Metal Thickness: 18 guage.
c. Compartment:

1) Dimensions: 21” x 15-3/4” x 10-1/8” deep.
2) Drain: Grid with NPS 2 tailpiece and twist drain.

a) Location: Centered in compartment.

d. Faucet(s): Sink See Fixture Schedule on Drawing:

1) Number Required: One.
2) Mounting: Deck.

e. Supplies: NPS 1/2 chrome-plated copper with stops or shutoff valves.
f. Drain Piping: NPS 2 chrome-plated, cast-brass P-trap; 0.045-inch- thick tubular brass waste to wall; and wall escutcheon(s).

2.13 INDIVIDUAL SHOWERS

A. Individual Showers, P-7:

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. Aker Plastics Co., Inc.
b. Clarion Bathware.
c. Florestone Products Co., Inc.
d. LASCO Bathware.
e. Praxis Industries, Inc.; Aquarius Products.
f. Sterling Plumbing Group, Inc.
g. Swan Corporation (The).

2. Description: Accessible, FRP shower enclosure with slip-resistant bathing surface and shower rod with curtain.

a. Size: 43 by 39 inches.
b. Surround: One piece.
c. Surround: One piece.
d. Color: White.
e. Drain Location: Center.
f. Accessibility Options: Include grab bar and bench.
g. Faucet: See Fixture Schedule on Plan.
h. Drain: Grid, NPS 2.

2.14 SERVICE BASINS

A. Service Basins, P-4:

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. Crane Plumbing, L.L.C./Fiat Products.
b. Florestone Products Co., Inc.
c. Precast Terrazzo Enterprises, Inc.

2. Description: Flush-to-wall, floor-mounting, precast terrazzo fixture with rim guard.

a. Shape: Rectangular.
b. Size: 24 by 36 inches.
c. Height: 12 inches.
d. Tiling Flange: See Architectural.

e. Rim Guard: On all top surfaces.
f. Color: Not applicable.
g. Faucet: Sink See Fixture Schedule on Drawing.
h. Drain: Grid with NPS 3 outlet.

2.15 UTILITY SINK

A. Utility Sink, P-9:

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. Crane Plumbing, L.L.C./Fiat Products.
b. Florestone Products Co., Inc.

2. Description: Stand-mounting, plastic laundry trays.

a. Size: 22-7/8 by 23-3/8 inches.
b. Color: Not applicable.
c. Faucet: See Plan Schedule.

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 off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install wall-mounting fixtures with tubular waste piping attached to supports.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to roughing-in drawings.

G. 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 ball, gate, or globe valves if supply stops are not specified with fixture. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install toilet seats on water closets.

J. 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.

K. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.

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. Set shower receptors and service basins in leveling bed of cement grout. Grout is specified in Division 22 Section "Common Work Results for Plumbing."

N. 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.

3.5 ADJUSTING

A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.

B. Operate and adjust mixing valves and electronic controls. Replace damaged and malfunctioning units and controls.

C. Adjust water pressure at faucets and flushometer valves 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 22 40 00

SECTION 22 45 00 - EMERGENCY 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 emergency plumbing fixtures:

1. Eyewash equipment.
2. Combination units.
3. Water-tempering equipment.

B. Related Sections include the following:

1. Division 22 Section "Domestic Water Piping Specialties" for backflow preventers.
2. Division 22 Section "Sanitary Waste Piping Specialties" for floor drains.

1.3 DEFINITIONS

A. Accessible Fixture: Emergency plumbing fixture that can be approached, entered, and used by people with disabilities.

B. Plumbed Emergency Plumbing Fixture: Fixture with fixed, potable-water supply.

C. Tepid: Moderately warm.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include flow rates and capacities, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Product Certificates: Submit certificates of performance testing specified in "Source Quality Control" Article.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For emergency plumbing fixtures to include in maintenance manuals.

1.5 QUALITY ASSURANCE

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

B. ANSI Standard: Comply with ANSI Z358.1, "Emergency Eyewash and Shower Equipment."

C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities for plumbing fixtures for people with disabilities.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

PART 2 - PRODUCTS

2.1 EYEWASH EQUIPMENT

A. Eyewash Equipment, P-6A:

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. Encon Safety Products.
b. Guardian Equipment Co.

2. Description: Plumbed, freestanding eyewash equipment.

a. Capacity: Deliver potable water at rate not less than 0.4 gpm for at least 15 minutes.
b. Supply Piping: NPS 1/2 chrome-plated brass or stainless steel with flow regulator and stay-open control valve.
c. Control-Valve Actuator: Paddle.
d. Receptor: Plastic bowl.
e. Drain Piping: Omit drain piping.

2.2 COMBINATION UNITS

A. Combination Units, P-6:

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. Encon Safety Products.
b. Guardian Equipment Co.

2. Description: Plumbed, freestanding, with emergency shower and eye/face wash equipment.

a. Piping: Galvanized steel.

1) Unit Supply: NPS 1-1/4 minimum from top.
2) Unit Drain: Outlet at side near bottom.
3) Shower Supply: NPS 1 with flow regulator and stay-open control valve.
4) Eye/Face Wash Supply: NPS 1/2 with flow regulator and stay-open control valve.

b. Shower Capacity: Deliver potable water at rate not less than 20 gpm for at least 15 minutes.

1) Control-Valve Actuator: Pull rod.
2) Shower Head: 8-inch minimum diameter, plastic.

c. Eye/Face Wash Equipment: With capacity to deliver potable water at rate not less than 3.0 gpm for at least 15 minutes.

1) Control-Valve Actuator: Paddle.
2) Receptor: Plastic bowl.

2.3 WATER-TEMPERING EQUIPMENT

A. Water-Tempering Equipment, P-6:

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. Armstrong International, Inc.
b. Bradley Corporation.
c. Encon Safety Products.
d. Haws Corporation.
e. Lawler Manufacturing Co., Inc.
f. Powers, a Watts Industries Co.
g. Speakman Company.

2. Description: Factory-fabricated, hot- and cold-water-tempering equipment with thermostatic mixing valve.

a. Thermostatic Mixing Valve: Designed to provide 85 deg F tepid, potable water at emergency plumbing fixtures, to maintain temperature at plus or minus 5 deg F throughout required 15-minute test period, and in case of unit failure to continue cold-water flow, with union connections, controls, metal piping, and corrosion-resistant enclosure.

2.4 SOURCE QUALITY CONTROL

A. Certify performance of plumbed emergency plumbing fixtures by independent testing agency acceptable to authorities having jurisdiction.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water piping systems to verify actual locations of piping connections before plumbed emergency plumbing fixture installation.

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

3.2 EMERGENCY PLUMBING FIXTURE INSTALLATION

A. Assemble emergency plumbing fixture piping, fittings, control valves, and other components.

B. Install fixtures level and plumb.

C. Fasten fixtures to substrate.

D. Install dielectric fitting in supply piping to fixture if piping and fixture connections are made of different metals. Dielectric fittings are specified in Division 22 Section "Common Work Results for Plumbing."

E. Install thermometers in supply and outlet piping connections to water-tempering equipment. Thermometers are specified in Division 22 Section "Meters and Gages for Plumbing Piping."

F. Install indirect waste piping to wall on drain outlet of fixture receptors that are indicated to be indirectly connected to drainage system. Drainage piping is specified in Division 22 Section "Sanitary Waste and Vent Piping."

G. Install escutcheons on piping wall and ceiling penetrations in exposed, finished locations. Escutcheons are specified in Division 22 Section "Escutcheons for Plumbing Piping."

H. Install equipment nameplates or equipment markers on fixtures and equipment signs on water-tempering equipment. Identification materials are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

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 hot- and cold-water-supply piping to hot- and cold-water-tempering equipment. Connect output from water-tempering equipment to emergency plumbing fixtures.

C. Indirectly connect emergency plumbing fixture receptors without trapped drain outlet to sanitary or storm drainage piping.

3.4 FIELD QUALITY CONTROL

A. Mechanical-Component Testing: After plumbing connections have been made, test for compliance with requirements. Verify ability to achieve indicated capacities and temperatures.

B. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

C. Report test results in writing.

3.5 ADJUSTING

A. Adjust or replace fixture flow regulators for proper flow.

B. Adjust equipment temperature settings.

END OF SECTION 22 45 00

SECTION 22 47 00 - DRINKING FOUNTAINS AND WATER COOLERS

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 water coolers and related components:

1. Pressure water coolers.

1.3 DEFINITIONS

A. Accessible Water Cooler: Fixture that can be approached and used by people with disabilities.

B. Cast Polymer: Dense, cast-filled-polymer plastic.

C. Drinking Fountain: Fixture with nozzle for delivering stream of water for drinking.

D. Fitting: Device that controls flow of water into or out of fixture.

E. Fixture: Drinking fountain or water cooler unless one is specifically indicated.

F. Remote Water Cooler: Electrically powered equipment for generating cooled drinking water.

G. Water Cooler: Electrically powered fixture for generating and delivering cooled drinking water.

1.4 SUBMITTALS

A. Product Data: For each fixture indicated. Include rated capacities, furnished specialties, and accessories.

B. Shop Drawings: Diagram power, signal, and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For fixtures to include in emergency, operation, and maintenance manuals.

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. 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 fixtures for people with disabilities.

C. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

D. ARI Standard: Comply with ARI's "Directory of Certified Drinking Water Coolers" for style classifications.

E. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.

F. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 PRESSURE WATER COOLERS

A. Water Coolers, P-5:

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. Oasis Corporation.
   b. Halsey Taylor.
   c. Haws Corporation.

2. Description: Accessible**,** ARI 1010, Type PB, pressure with bubbler, recessed, wall-mounting water cooler.

   a. Cabinet: Bilevel with two attached cabinets, Bilevel with two all stainless steel.
   b. Bubbler: One, with adjustable stream regulator, located on each cabinet deck.
   c. Control: Push button.
   d. Supply: NPS 3/8 with ball, gate, or globe valve.
   e. Filter: One or more water filters complying with NSF 42 and NSF 53 for cyst and lead reduction to below EPA standards; with capacity sized for unit peak flow rate.
   f. Drain(s): Grid with NPS 1-1/4 minimum horizontal waste and trap complying with ASME A112.18.1.

g. Cooling System: Electric, with hermetically sealed compressor, cooling coil, air-cooled condensing unit, corrosion-resistant tubing, refrigerant, corrosion-resistant-metal storage tank, and adjustable thermostat.

1) Capacity: 8 gph of 50 deg F cooled water from 80 deg F inlet water and 90 deg F ambient air temperature.
2) Electrical Characteristics: 120-V ac; single phase; 60 Hz.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water and waste piping systems to verify actual locations of piping connections before fixture installation. Verify that sizes and locations of piping and types of supports match those indicated.

B. Examine walls and floors for suitable conditions where fixtures are to be installed.

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

3.2 APPLICATIONS

A. Use mounting frames for recessed water coolers, unless otherwise indicated.

3.3 INSTALLATION

A. Install mounting frames affixed to building construction and attach recessed water coolers to mounting frames, unless otherwise indicated.

B. Install fixtures level and plumb. For fixtures indicated for children, install at height required by authorities having jurisdiction.

C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to water distribution piping. Use ball, gate, or globe valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Division 22 Section "General-Duty Valves for Plumbing Piping."

D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

E. Seal joints between fixtures and walls and floors using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 07 Section "Joint Sealants."

3.4 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."

3.5 FIELD QUALITY CONTROL

A. Water Cooler Testing: After electrical circuitry has been energized, test for compliance with requirements. Test and adjust controls and safeties.

1. Remove and replace malfunctioning units and retest as specified above.
2. Report test results in writing.

3.6 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust water cooler temperature settings.

3.7 CLEANING

A. After completing fixture installation, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.

END OF SECTION 22 47 00