

PROJECT MANUAL

Montgomery County **MC-NPL** Norristown, Pennsylvania Div 0-14

Prepared by
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1001 Powell Street
Norristown Pennsylvania 19401
Project Number 23-033

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SECTION 011000 – SUMMARY OF WORK**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work by Owner.
4. Work under separate contracts.
5. Owner-furnished products.
6. Contractor-furnished, Owner-installed products.
7. Access to site.
8. Coordination with occupants.
9. Work restrictions.
10. Specification and drawing conventions.
11. Miscellaneous provisions.

- B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: Montgomery County Norristown Public Library (MCNPL) Phase 1 Interior Demolition

1. Project Location: 1001 Powell Street, Norristown, PA 19401

- B. Owner: Montgomery County

- C. Architect: Kimmel Bogrette Architecture + Site

- D. Construction Manager as Advisor (CMa): Skanska USA Building Inc.

1. Construction Manager as Advisor has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and each Contractor, according to a separate contract between Owner and Construction Manager as Advisor.

2. The Construction Manager as Advisor is indicated throughout these specifications as CMA. Any reference to Construction Manager is intended to refer to the CMA.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Project scope includes full renovation and addition in accordance with the documents prepared by Kimmel Bogrette Architecture. This is Phase 2 of this project consisting of the exterior skin demolition, select demolition along with renovations to both the exterior building skin and entire interior with all new MEP systems. Sitework is also included in this phase.
2. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011200 "Multiple Contract Summary" for a description of work included under each of the multiple contracts. Contracts for this Project include the following:
 - a. General Construction (GC)
 - b. Electrical Construction (EC)
 - c. Mechanical Construction (MC)
 - d. Plumbing Construction (PC)
 - e. Fire Protection (FPC)

1.5 WORK BY OWNER

A. General:

1. This Section, Work by Owner, is intended to discuss activity performed under contracts outside of the five multiple-prime contracts to which these specifications apply.
2. Cooperate fully with Owner so work may be carried out smoothly, without interfering with or delaying work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.6 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations as indicated by requirements of this Section and as noted on the Site Logistics Plan.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not use or disturb portions of Project site beyond areas in which the Work is indicated except as approved by Owner.

1. Limits:
 - a. All deliveries and trash removal can occur during normal business hours.
2. Off-hours work & use of elevators:
 - a. For the purpose of the Base Bid, Contractor may assume that all work inside and outside of the building will occur during regular business hours. Elevators are not to be used for personnel or material transport.
3. Building Access
 - a. There are no restrictions to accessing the building.
 - b. The General Construction Prime Contractor shall provide signage, markings and other protection to distinguish access paths and provide appropriate warnings related to the flow of construction.
 - c. Construction fence shall remain closed during off-hours.
 - d. Tools and Materials are to be contained within designed construction areas except and only except for tools and materials required for approved work outside designated construction access areas. Tools and materials found outside of designated construction and construction access areas will be confiscated.
 - e. Keys required for construction access will be provided by Montgomery County
 1. Each Prime Contractor's foreman will be issued a key for the building.
4. See Section 015000 Temporary Facilities and Controls for further information regarding use of stairs, driveways, walkways and entrances: Refer to Construction Logistics Plan included in the Appendix Folder on Bonfire which is part of the Project Manual. Keep driveways, parking garage, loading areas, and entrances serving Montgomery County Norristown Public Library clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- c. Where sidewalk or doorway closures are required provide protection of work areas and signage to clearly direct the public and building occupants to alternative paths and points of access.
- d. Order the work to maximize the opportunities for alternative paths and access points. If no alternative is available, provide a clear work plan to the CMA at least 2 weeks in advance of the closure. Work plan shall assume that work will be performed off-hours including all related premium time and shall be intermittent to allow for access during business hours.

1.7 COORDINATION WITH OCCUPANTS

- A. Owner Occupancy: The MCNPL building will not be occupied when the construction work commences.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, without written permission from Owner and authorities having jurisdiction.
 - 2. Except as specifically indicated herein, notify Owner not less than 72 hours in advance of activities that will affect Owner's operations in any way not anticipated in the approved Construction Logistics Plan.

1.8 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: 7:00 AM – 3:30 PM Monday through Friday, unless otherwise indicated.
 - 1. Off Hours: 3:30 PM to 7:00 AM
- C. Project Security, Background Checks and Badging Requirements
 - 1. Security badges / Hardhat sticker credentials will be required to perform work on site.
 - 2. The General Construction Prime Contractor shall be responsible to establish in cooperation with the Owner, a protocol for securing all construction access points during and at the end of each shift.

- D. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
1. Notify Owner not less than ten (10) business days in advance of proposed utility interruptions.
 2. Obtain Owner's written permission before proceeding with utility interruptions.
- E. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruptions to CMA.
1. Notify Owner not less than five (5) business days in advance of proposed disruptive operations.
 2. Obtain Owner's written permission before proceeding with disruptive operations.
 3. Contractor is alerted to Borough of Norristown Code, Chapter 229-1 Noise, excerpted below:
 - a. The following acts are declared to be unlawful:
 1. Construction activities including hauling, excavation, demolition, equipment operation or any other construction activity that creates a loud noise, between 7:30 PM and 7:00 AM, Monday through Friday, and between 8:00 PM and 9:00 AM on Saturday and Sunday.
- F. Nonsmoking Building: Smoking is not permitted onsite.
- G. Controlled Substances: Use of tobacco products within the site ~~existing building~~ is not permitted.

1.9 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 - 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 - 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 - 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 12 00 - MULTIPLE CONTRACT SUMMARY

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes a general summary, and not all inclusive, of each contract, including responsibilities for coordination and temporary facilities and controls.
- B. Specific requirements for Work of each contract are also indicated in individual Specification Sections and on Drawings.
- C. Related Requirements:
 - 1. Section 011000 "Summary" for the Work covered by the Contract Documents, restrictions on use of Project site, phased construction and work restrictions.
 - 2. Section 013100 "Project Management and Coordination" for general coordination

1.3 DEFINITIONS

- A. Construction Manager as Advisor (CMa): Referred to herein as CMa or CM.

1.4 WORK BY OWNER

- A. Not Applicable

1.5 ACCESS TO SITE

- A. General: Contractors shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not use or disturb portions of Project site beyond areas in which the Work is indicated except as approved by Owner.

1. Limits: Refer to drawings and logistics plan(s).
 - a. Coordinate the use of the available space onsite. If necessary, provide offsite storage of materials and equipment if space is not available on site.
2. Owner Activities & Operations:
 - a. The building will not be occupied during Phase 2.
- C. Building Access
 1. Refer to logistics plans included as an Appendix in the contract documents. The logistic plans shall be followed at all times.
 2. All contractors will have full access to the site.
- D. See Section 01 50 00 Temporary Facilities and Controls for further information regarding use of stairs, driveways, walkways and entrances: Refer to Construction Logistics Plans included as an appendix document.
 1. Contractors' office space is provided by owner. Desks and chairs also provided for Prime Contractor's foreman along with a conference area and bathrooms on each level of office building. Individual prime contractor office trailers will not be permitted. Please refer to logistics plan for added detail.
 2. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 3. Hoisting is not permitted over walkways, exit doors and driveways without posting a signal person to prevent personnel or vehicle traffic from entering the area.
 4. Swinging loads over occupied buildings is not permitted.

1.6 COORDINATION WITH OCCUPANTS

- A. WORK RESTRICTIONS
 1. Work Restrictions, General: Comply with restrictions on construction operations.
 - a. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
 - b. On-Site Normal Work Hours: 7:00 AM – 3:30 PM Monday through Friday. Contractors intending to work outside normal work hours and/or weekends shall follow all AHJ / City of Norristown ordinances and receive approval by the CMA or Owner.

- c. Off Hours: 3:30 PM to 7:00 AM.
 - d. If second shift is required and approved by the CMA hours shall be: 1st shift 7:00 AM – 3:30 PM / 2nd shift – 3:30 PM – 7:30 PM or to the limits approved by the AHJ / City of Norristown.
- B. Project Security, Background Checks and Badging Requirements
 - 2. Security badges / Hardhat sticker credentials will be required to perform work on site.
- C. Existing Utility Interruptions: Coordinate with CMA and County prior to any utility interruptions.
 - 3. Notify CMA not less than ten (10) business days in advance of proposed utility interruptions.
 - 4. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Other General Provisions
 - 5. The use of tobacco, alcohol, vaping, marijuana, illegal substances and/or other similar substances is prohibited. Workers found using these substances will be immediately removed from the project.
 - 6. Weapons including but not limited to firearms, mace, explosives are prohibited on site. Any person found with weapons will be permanently removed.

1.8 PROJECT COORDINATION

- A. All Prime Contractors shall each be fully responsible for the coordination of the work performed by their own forces and those of their contractors. Each of these Contractors is also responsible to cooperate with each other and with the CMA to coordinate the entire work insofar as their individual work affects the work of the others and the whole. See Section 013100 – Project Management and Coordination and Section 013200 Construction Progress Documentation for LEAN PROCEDURES which includes requirements for participation in specification coordination and scheduling activities.
- B. MEP Coordination-
 - 1. Mechanical Coordination for the above ceiling will be led by the Mechanical Prime Contractor with coordination required by all Primes. CAD drawings from the design team will be made available pending a signed release form executed by each receiving party. A final set of coordination drawings is a required submittal.
 - 2. Underground and in concrete slab coordination will be led by the Plumbing Prime Contractor with coordination required from all Primes.

- C. Scheduling: Refer to specific requirements listed in specification 013100 & 013200. All Prime Contractors shall coordinate the scheduling activities of their work and to assist in preparation of an overall project schedule. Baseline schedule and monthly updates will be managed by CMA. Each Multiple-Prime Contractor shall be fully responsible for the development and maintenance of a project schedule associated with their own work, updated as required to coordinate with the overall project schedule.
- D. The CMA's coordination activities include, but are not limited to, the following:
 - 1. Facilitate overall coordination of the Work.
 - 2. Coordinate, schedule, and facilitate approval of interruptions of permanent and temporary utilities, including those necessary to make connections for temporary services.
 - 3. Facilitate coordination of completion of interrelated punch list items.
 - 4. Coordinate preparation of Project record documents if information from more than one contractor is to be integrated with information from other contractors to form one combined record.
 - 5. Coordinate preparation of operation and maintenance manuals if information from more than one contractor is to be integrated with information from other contractors to form one combined record.

1.9 GENERAL REQUIREMENTS OF CONTRACTS (ALL PRIMES)

- A. Extent of Contract: Unless the Agreement contains a more specific description of the Work of each Contract, requirements indicated on Drawings and in Specification Sections determine which contract includes a specific element of the Project.
 - 1. Contractor acknowledges and agrees that it has taken into account all items necessary to complete the Work of each contract. The Work shall be provided in accordance with the Contract Documents and shall include, but not limited to all labor, supervision, material, supports, engineering, tools, equipment, access to work, hoisting, rigging, transportation, permits, taxes, insurance, fees, warranties and guarantees required to perform the complete Work as shown or described in this Summary and the Contract Documents. Contractor shall include all items necessary and/or implied but not necessarily detailed on the Contract Documents or as may be required by local codes and jurisdictions for complete and working systems. No extra compensation will be allowed for any errors or omissions on the part of the Contractor or its contractors and/or Suppliers.
 - 2. It is the responsibility of each contractor to review all the Contract Documents provided. All Contract Drawings, Specifications, and supplemental information are part of each contract. Where specifications, drawings, other information

provided contain conflicting information, then the provisions, terms, and conditions of the more stringent shall take precedence.

3. Contractor has visited the site and is familiar with all work conditions. Contractor has reviewed existing conditions in the field and is familiar with security requirements, traffic regulations and other restrictions affecting access to the Work.
4. All prime and sub-tier contractors are required to be licensed with all jurisdictions required including but not limited to the State of Pennsylvania, the Municipality of Norristown, etc.
5. Contractor will secure and pay for all permits required to complete this scope of work outside of the building permit including but not limited to street & sidewalk closures (which includes lost parking revenue), utility tie ins, etc. Owner will be responsible for the cost of the general building permit. Contractor is responsible to fill out necessary forms, submit to Norristown and file after award.
6. Provide labor and supervision to assist with all AHJ inspections and specialty inspections.
7. Contractor is fully knowledgeable of all applicable Municipality of Norristown, Pennsylvania Dept. of Transportation (PENNDOT) and Manual on Uniform Traffic Control Devices (MUTCD) requirements and will comply with same throughout the duration of this project.
8. Contractor shall reference historical drawings, photographs and other information provided in conjunction with design documents to determine the full scope of work and means and methods necessary to complete the work of this bid package.
9. Contractor is responsible to resolve labor disputes and jurisdictional claims for all work associated with this bid package.
10. Parking on site for Phase 2 will be limited. At different stages of the project, parking may be restricted to essential vehicles and tool trucks only.
11. All street closures must be approved by the governing authority.
12. Delivery and Storage:
 - a) Reference logistics plans provided for site storage and staging.
13. All Prime Contractors superintendents will accompany the AHJ and CMA during inspections. If re-inspection is required for incomplete work, the responsible Prime contractor will be required to compensate the CMA and AHJ for re-inspections.
14. Construction Cleaning

- a. General Contractor will provide and maintain dumpsters at the exterior of the building for all prime contractors use. Each Prime Contractor shall remove trash and construction debris **DAILY** throughout the construction duration, and each Prime Contractor shall provide means of transport for trash to the exterior dumpsters provided. Each prime contractor shall rough broom sweep work areas **DAILY** at the end of each shift.
 - b. Access pathways shall be kept clean and free of debris.
 - c. Areas that are not kept clean per the contract requirements or cleaned in a timely manner (DAILY) will be cleaned by others, as directed by the CMA at the Contractor's expense.
 - d. All contractors are responsible for cleaning tools, work surfaces and all common surfaces as required to prevent and mitigate the spread of infectious diseases. Each prime and sub-tier contractor is required to develop and implement protocols to protect its workers including cleaning, temperature screening and other measures deemed necessary.
 - e. Any materials or debris that can be windblown must be secured at all times. Contractors must take into account the conditions and potential for high winds as work progresses and take all precautions necessary to prevent items from blowing off the roof.
15. Contractor understands temporary lighting will be provided at the levels required by OSHA by the Electrical Prime. If additional lighting is required to perform work of this bid package, each Prime Contractor will provide the additional temporary lighting needed.
16. All contractors are responsible to provide their own temporary power until the temporary power distribution is completed by the Electrical Prime Contractor.
17. All Prime contractors are required to use Trimble Unity Construct (E-Builder) for all project management communications and invoicing. Any training required for this system will be provided by Montgomery County.
18. Prime Contractors are required to submit a sample AIA G732 and G703 listed by project specifications (feature of work), floor level, Career Links Center, along with a labor and material breakdown for approval by the CMA. The approved AIA Schedule of Values will be for the purpose of creating the Prime Contractor's monthly Pencil Copy and Requisition. Please reference 012900 – Payment Procedures.
19. All Prime Contractors are required to participate in the Skanska Asset Management Program. Warranty, Technical Data, Closeout Documentation, Owner Training, Maintenance and Care information submitted and approved. Scheduled Value on AIA is \$25,000 per Prime.
20. When submitting a change order or allowance adjustment, Prime Contractors are required to provide all subcontractor and material suppliers quotes and proposals

with a labor and material breakdown. Indicate any potential schedule impacts associated with the submitted change order. The intent is to expediate the approval process. Please reference 012600 Contract Modification Procedures.

1.10 GENERAL SAFETY REQUIREMENTS

- A. Each prime contractor is fully responsible for all aspects of safety for their scope of work including but not limited to supervision, planning, training, project orientations and coordination with other contractors.
- B. Prime contractors and associated contractors working onsite shall comply with all applicable government regulations, specific client rules and regulations, and requirements dictated within the project specification requirements. If any of these standards, requirements, rules or procedures conflict, the most stringent one will prevail.
- C. It is the responsibility of ALL Prime Contractors to make sure their employees and contractors understand all job site rules, safety procedures and come to the site prepared to complete their scheduled work with clear direction from the Prime Contractor on the scope of the work, schedule, current drawings, specifications and sketches.
- D. Minimum PPE will include hard hat, high visibility clothing, cut resistant gloves – minimum level 3, safety glasses and sturdy work boots/Foot protection & work attire including long pants and sleeved shirts. ANSI reflectivity requirements must be met when working in traffic and/or at night. It is the Prime Contractor's responsibility to provide additional PPE as required for their task. PPE shall be worn at all times.
- E. **Each prime shall submit a Project Specific Safety & Environmental Plan addressing the hazards of their scope of work and mitigation plans to control the hazards.** Plan shall be submitted two weeks prior to the start of the prime's work for review by the CMA and Owner. The format of the PSSP shall follow the template provided by CMA. Contractors shall refer to the table contained below to reference minimum worker training requirements. The PSSP shall:
 - 1. Identify each component of the work that the contractor is responsible for completing.
 - 2. Identify hazards associated with the work and the proper equipment and tools to perform the work.
 - 3. Plan adequate and sufficient controls to protect their work crews.
 - 4. If the project specific safety plan needs revision due to scope of work changes, unanticipated or new hazards, other condition changes, etc., then all work pertaining to that work component will stop until a new project specific safety plan is completed.

PSSP Minimum Worker Training Requirements		
Topic	Who Needs Training	What Training is Needed
Project Specific Safety Orientation	All project management, supervision, and workers entering the project	Safety rules and procedures contained in the Safety & Health Management Program (SHMP), site-specific emergency action plan, each worker's responsibilities, disciplinary program, and warm up and stretching exercises
Hazard Communication	All workers entering the project	Hazard Communication Basic Training (Refer to Hazard Communication Program in this SHMP)
Hazardous Chemical or Substance	Workers exposed to a hazardous chemical or substance	Specific Hazard Communication Training (Refer to Hazard Communication Program in this SHMP)
Respiratory Protection	Workers required to wear respiratory protection, including common dust masks	OSHA 29 CFR 1910.134 & 139 or 1926.103
Fall Protection	Any worker who might be exposed to a fall hazard	• The nature of fall hazards • Procedures for erecting, disassembling, maintaining and inspecting fall protection systems. • Use and operation of guardrail systems, personal fall arrest systems, safety net systems, warning line systems, controlled access zones and other fall protection. • Procedures for handling equipment and erection of overhead protection • Fall protection standards. • Rescue Plan
PPE	Workers using PPE	Refer to section on PPE or regulatory standards
Forklifts	Operators of powered industrial trucks	• Types of trucks operated. • Hazards of the workplace • Hands-on performance evaluation
Confined Spaces	Any worker attending to, supervising, entering or working within a confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Air monitoring
Permit-Required Confined Spaces	Any worker attending to, supervising, entering or working within a permit-required confined space	• Hazards of the space • Duties of entrants, attendants, supervisors • Measures used to eliminate or control hazards. • Air monitoring requirements • Emergency procedures/rescue equipment • Communications • Permitting procedure

		• PPE
Excavations/ Trenches	Workers entering or working within an excavation/trench	• Hazards of the space (slides, cave-ins, water accumulation, etc.) • Safe means of access/egress • Proper support system procedures (erection, maintenance, disassembly and inspection)
Lockout/Tagout	Workers affected by hazardous energy sources	• Nature of known hazardous energy sources. • Project-specific Lockout/Tagout procedures
Gas Welding & Cutting	Workers conducting gas welding and/or cutting	• The safe use of fuel gas
Arc Welding & Cutting	Workers conducting arc welding and/or cutting	• What to do with unattended machines and electrode holders • Operations around water • Shielding arc welding
Hot Work	Workers conducting hot work activities	• Hazards of the area • Permits • Duties of Fire Watch • How to use a fire extinguisher
Scaffolding	Workers working from scaffolding	• The nature of any known hazards • Proper erection, maintenance and disassembly of fall protection systems • Falling object protection • Material/equipment handling from scaffold. • Maximum load-carrying capacity • Scaffold tagging system. • Access and egress
Crane Baskets	Workers working from crane baskets	• Safe work rules • 100% fall protection • Lift plans contents • Emergency procedures
Silica	Workers potentially exposed to Respirable crystalline silica	• Hazards of Respirable crystalline silica • Understanding Table 1 • If needed, respiratory protection program

F. Crew Daily Pre-Task Safety & Hazard Analysis Planning (DHA)

1. A Daily Pre-Task Safety & Hazard Analysis Plan will be completed daily by each crew performing work on this project. The CMA will provide a template if requested by the contractors.

2. Each foreman/first-line supervisor will analyze task(s) to be performed by their crew and identify the work sequences, hazards, training, controls and emergency action plans necessary to protect workers from the identified hazards.
3. The work will be broken down into individual steps (i.e., all the steps the work crew will have to take in order to complete that task); the known hazards associated with the work; and the hazard controls (tools, safety equipment, safety rules, safe work practices, etc.). This is a time for workers to provide input into the pre-task plan.
4. Foreman/first-line supervisors will review the plan with their respective work crew so that each worker is aware of what work activities will occur during the shift, what hazards to be aware of and how to properly control or eliminate those hazards. Each worker will sign the plan stating that they understand the work activities, hazards and controls. This is also an acknowledgement that each worker agrees to work according to the plan.
5. The completed pre-task plan shall be posted in a conspicuous location near the work activity.
6. Those tasks with similar work can use prior pre-task plans, but the plan must still be dated and reviewed with crew members at the beginning of the shift. If the scope of work changes or a new hazard appears during the work, the first-line supervisor will stop their crew members and revise the pre-task plan.
7. End of shift sign off. Each worker is required to sign off at the end of shift confirming that any injuries were reported.

G. **Hazardous Materials**

1. All hazardous material per the Environmental Survey have been removed in the Phase 1 – Demo and Abatement portion of the project with exception of the roof membrane.
2. In the event unknown suspected hazardous materials are uncovered during the course of the work, all workers shall stop work and notify the CMA and Owner.

H. Each contractor will be held in strict accordance with all safety and environmental regulations and requirements. Any worker that fails to follow the policies will be dealt with in accordance with the disciplinary program as described below. Prime and/or contractor supervision (inclusive of onsite and office personnel) that oversee workers that have reoccurring safety or disciplinary infractions will be removed from the project site in addition to worker(s) violating the project requirements.

1. **Disciplinary Program**
 - a. At-risk behavior on this project that could contribute to an incident or injury will not be tolerated. Each worker has an individual responsibility to work safely, and each first-line supervisor is responsible to correct at-risk behavior of workers under their direction.

- b. At-risk behaviors considered Immediately Dangerous to Life or Health that may result in immediate termination from the project, include, but are not limited to:
 - 1. Failure to follow the Fall Protection Policy
 - 2. Failure to follow the Substance Abuse Policy
 - 3. Possession of firearms, explosives or dangerous weapons
 - 4. Theft and other criminal activity
 - 5. Entering or allowing to enter an unprotected trench or excavation.
 - 6. Failure to follow lockout/tagout procedures.
 - 7. Fighting, horseplay, or practical joking
 - 8. Entering or allowing to enter, a confined space without following procedures.
 - 9. Unsafe and/or reckless operation of motorized vehicles or equipment
 - c. For those acts or practices not considered Immediately Dangerous to Life or Health the following will apply:
 - 1. First occurrence: Verbal, written warning, and/or re-training by the prime contractor
 - 2. Second occurrence: Written warning, re-training, suspension, or termination from the project
 - 3. Third occurrence: Termination from the project
- I. No work will be performed on any energized electrical circuit, buss-bars, equipment, or panels unless an approved written work plan is developed in accordance with Chapter 1 of NFPA 70E and submitted to Skanska for review prior to performance of work.
- J. Electrical equipment and tools used on this project shall be inspected by a competent person to prevent any worker from receiving an accidental electrical shock. This rule will apply to all cord sets, portable electrical equipment, tools and appliances not part of any permanent building or structural electrical systems.
- K. All temporary cords will be three wire, 16 gauge or heavier, with a hard or extra hard duty rating.
- L. Electrical Cord Management
 - 1. All cord sets will be elevated above the work surface when practical.
 - 2. Wire, nails, or other conductive material will not be used to hang or attach cord sets or welding leads.

3. Cord sets that cross roadways will be protected from damage by vehicle and equipment traffic by devices such as hose bridges.

M. General Electrical Requirements

1. Light stringers and halogen lamps will have the lamps protected from accidental contact or breakage and will be hung per manufacturer specifications.
2. UL approved covers are required on all panels, load centers, pull boxes, etc. prior to energizing. Necessary steps will be taken to prevent unauthorized or unqualified workers access to energized electrical parts or equipment.

N. Additional Fall Protection Requirements

1. Prime contractors, subcontractors, vendors, or other third-party individuals will take all practical measures to eliminate, prevent, and control fall hazards. All work will be planned with the intent to eliminate identified fall hazards. When a fall hazard has been identified and cannot be eliminated, then effective means of fall protection will be implemented. Acceptable fall protection systems included the following:
 - a. Guardrail systems
 - b. Safety netting
 - c. Covers for floor, roof and wall openings.
 - d. Positioning device systems
 - e. Protection from falling objects.
 - f. Personal fall arrest systems
2. Retractable lifelines shall be utilized with personal fall arrest systems; lanyards will not be acceptable.
3. **100% Fall Protection Required. All employees will be 100 percent protected while working six feet or higher off the ground or when hazards below six feet dictate enforcement at a lesser height.** This policy will apply to all contractors, even when OSHA allows for exceptions. In the event where local statutes require fall protection at less than six feet the more stringent standard will apply.
4. Workers engaged in steel erection activities, including but not limited to connecting, decking, and bolt up, are not exempt from the 100 percent fall protection requirements when working from heights of six feet or greater.

O. Fire Protection and Prevention

1. Prime contractor shall develop and provide a Fire Protection Plan in accordance with OSHA 29 CFR 1926 Subpart F.
2. All activities that require welding, cutting or an open flame is present require a minimum of 2-hour fire watch. Provide continuous fire watch, including off hours, for temporary heating using open flame units. Refer to specification 01 50 00 Temporary Facilities & Controls for further fire watch requirements.
3. Any temporary structures or protection shall be construction of non-combustible material or have a fire resistance rating of one (1) hour.
4. Hot work is defined as the use of open flames, other heat sources, and/or spark producing devices in areas where combustible or flammable materials are present and/or where there is potential for explosion or fire. Hot work activities include burning, welding, cutting, grinding or other operations that produce a flame, heat, or sparks.
 - a. Prior to performing "Hot Work" operations, workers shall notify the CMA in accordance with requirements set forth in the contract documents. The CMA will coordinate with the owner's activities and provide written confirmation before any hot work can commence.

P. Flammable Liquid Storage & Dispensing

1. Storage of flammable liquids are to be stored in fireproof containers as required by OSHA.
2. No flammable, combustible, or explosive gasses or liquids are permitted to be stored on the roof over night.
3. Gas powered generators are not permitted on the roof.

Q. Prime Contractor Safety Personnel

1. Each contractor shall designate an experienced and fully trained member of the Contractor's organization at the Project Site whose duty shall include the prevention of accidents and the enforcement of the project safety requirements relating the contractor's work.
 - a. Contractors shall coordinate, through the Construction Manager, and conduct, weekly onsite safety inspections. Prime Contractors shall designate safety representative, with a focus on the contractor's safety duties and responsibilities. Contractors shall submit a formal report of their findings, within one day, and advise Montgomery County for corrective actions to address any issues identified during the walk through.

2. Contractors that have less than thirty (30) workers on-site (including tiered subcontractors) will designate a safety representative prior to mobilization. This on-site safety representative will be a competent worker who has completed at least 30 hours of OSHA awareness training and who may have other on-site duties. This worker must be onsite at all times to serve in this capacity.
 - a. Contractors that have thirty (30) or more workers (including tiered subcontractors) will provide a full-time on-site safety professional upon mobilization. This person shall have no other responsibilities.
 - b. Contractors will submit the resume of their proposed safety professional or representative to be reviewed by the CMA. The CMA will determine if the proposed safety professional or representative has the training and experience required for this project. This person will have the authority and responsibility to ensure the proper implementation of safety requirements stipulated within their PSSP and project requirements.
 - c. Contractor safety professionals and representatives will have the full authority to implement safety corrections and recommendations. Subcontractor safety professionals and representatives will have authority to stop any work they deem unsafe.
 3. **When prime contractor crew sizes are larger than 30 workers, inclusive of sub tier contractors, the contractor shall employ a full-time on-site safety professional. This individual shall be dedicated to safety oversight and not have a dual role. The safety professional shall have the following minimum qualifications:**
 - a. Five years construction experience, one year of which includes on-site construction safety responsibilities.
 - b. Specialized training relevant to scope of work.
 - c. OSHA 30-hour construction safety awareness course.
 - d. Working knowledge of safety regulations and hazard control methods.
 - e. Demonstrated ability to conduct safety training.
 - f. The minimum duties of the designated safety professional and/or representative will be:
 1. Investigate any incident or near miss and report the findings to Skanska.
 2. Attend safety meetings as required by CMA.
 3. Conduct regular safety meetings with workers to instruct them on project safety practices and requirements.
 4. Conduct written daily safety inspections of their work activities and make available to Skanska for review to ensure compliance with safe work practices and this Safety & Health Management Program.
- R. Take direction from Owner & CMA related to timely abatement and control of hazards.

S. Safety Meetings

1. Safety personnel are required to attend all meetings stipulated in the "Lean Procedures" including but not limited to Last Planner and Daily Huddles.
2. The CMA will conduct safety meetings monthly. These meetings will last one (1) hour and review all aspects of safety onsite. Each prime contractor safety personnel and key subcontractors shall attend.

T. Silica- if there is a potential for silica exposure, the contractor shall submit a Silica Control Plan. If the contractor opts not to follow Table 1 from OSHA 1926.1153 Respirable crystalline Silica standard, historical data must be provided.

U. Radios, headphones, and other music devices are prohibited. Any contractor employee using these devices will be removed from the project.

V. Testing and Inspections

1. All Prime Contractors shall fully cooperate with any Testing and Inspection agencies retained by Montgomery County including implementation of any remedial work recommended as a result of such inspections. It will be the responsibility of the Contractors to provide proper coordination and timely notification to the testing agency, inspecting authorities, etc. Reference the design specifications provided for further information.
2. All re-inspection cost due to failures and non-conformance will be the responsibility of contractor. Any and all specialized testing and/or inspections needed for temporary or permanent construction methodologies, not described in the design specifications, are the responsibility of the appropriate Prime or sub-tier contractor.
3. All Prime Contractors shall fully cooperate with any local and/or State inspection authority and coordinate inspections including any remedial work recommended as a result of such inspections. Any premium labor costs associated with such inspections will be the responsibility of the Contractor. Contractors shall identify inspection dates on weekly work schedule.
4. Prime Contractors will provide labor to assist in inspections by the AHJ and independent testing agencies.

W. Hazardous Materials

1. The GC shall understand the potential for mold at the exterior walls caused from water infiltration. The proper regulations and guidelines shall be followed when removing the exterior façade.

2. If suspicious material is identified that potentially contains ACM or hazardous materials, the Prime Contractors shall notify the CMA and halt work operations immediately. The situation will be reviewed by the Owner and a course of action determined. If necessary, the Owner will perform additional testing of the suspicious materials.

X. Daily Construction Reports

1. Daily Construction Reports shall be submitted electronically to the CMA and should be completed per project specifications. Each Prime Contractor is required to complete and submit daily reports which shall be written and signed by the contractors lead supervisor or foreman on site. The CMA will verify the reports to ensure details are accurately documented. Payments may be withheld upon failure to submit these reports.

Y. Site Condition Reports

1. Submit at time of discovery of differing conditions. All primes are responsible to review the project conditions prior to starting their work. Contractors shall report prior to the start of work any differing conditions and/or damages part of existing materials that are existing to remain. Issues that are not reported will be the responsibility of the prime contractor.

Z. Adjacent Buildings and Structures

1. Damages
 - a. All Contractors are cautioned that, because this work will be performed in close proximity and adjacent to existing occupied properties, all precautions, protection and care must be exercised to protect existing structures in accordance with good safety practices. This is particularly applicable to protection of pedestrians. The Contractor is responsible for any damage, which may occur to the property of the Owner or adjacent private or public properties which in any way results from the acts or neglect of his employees. In addition to repairing the damage at the expense of the Contractor, all damages thereto including damage to existing utilities and paving arising from operations under the Contract. Repair and protection is the Contractor's responsibility regardless of the assignment of responsibility for inspection, testing or similar services.

AA. Finished Work & Protection

2. All Contractors are wholly responsible for the protection of finished work, both their own and that of others, as may be required to perform their own work. Each Contractor is responsible for any damage which may occur to the property of any other Contractor connected with the work or to adjacent private or public

properties, or to any portion of the structure that in any way results from the acts of or neglect of his/her employees.

BB. Commissioning Support

1. Project will have a commissioning agent and program. Program will include, but not be limited to regular scheduled commissioning check-in meetings, reporting, testing and final reporting per the project specifications.

CC. Substitutions: Each contractor shall cooperate with other contractors involved to coordinate approved substitutions with remainder of the work.

DD. Temporary Facilities and Controls: In addition to specific responsibilities for temporary facilities and controls indicated in this Section and in Section 015000 "Temporary Facilities and Controls," each contractor is responsible for the following:

1. Plug-in electric power cords and extension cords, supplementary plug-in task lighting, and special lighting necessary exclusively for its own activities.
2. Computers, printers and office supplies necessary for its own activities.
3. Temporary enclosures for its own construction activities.
4. Staging and scaffolding for its own construction activities.
5. General hoisting facilities for its own construction activities.
6. Waste disposal facilities, including collection and legal disposal of its own hazardous, dangerous, unsanitary, or other harmful waste materials.
7. Progress cleaning of work areas affected by its operations on a daily basis.
8. Secure lockup of its own tools, materials, and equipment.
9. Construction aids and miscellaneous services and facilities necessary exclusively for its own construction activities.

EE. Each Contractor must inspect the roof areas daily for material and debris that can be blown from roof and take all measures to prevent same.

Low Voltage Responsibility Matrix:														
Each Prime is responsible to provide (furnish and install) all of their own raceways, pathways, junction boxes, supports, cutting, patching, sleeves, seals, blocking and connections within their systems as described within the 01 12 00 Multiple Contract Summary. Primes are to coordinate demark locations and connections with other Primes requiring.														
Prime contractors are responsible to employ the designated trade required to each task to install their system as complete.														
Frame and Door Preparations include internal door raceways, mortised openings, mounting brackets, and wire back boxes for hardware devices for new and existing doors and frames as listed within Division 08.														
	Furnished By:							Installed By:						
	General Contractor (GC)	Electrical Contractor (EC)	Mechanical Contractor (MC)	Plumbing Contractor (PC)	Fire Protection Contractor (FPC)	Owner	Utility	General Contractor (GC)	Electrical Contractor (EC)	Mechanical Contractor (MC)	Plumbing Contractor (PC)	Fire Protection Contractor (FPC)	Owner	Utility
Building Security System Interface														
Division 06 Wood Blocking & Plywood for Electric, LV, & AV	X							X						
Division 08 Hardware	X							X						
Division 08 Power Supplies	X								X					
Division 08 Power Supply line voltage conduit, wire, and connections		X							X					
Division 08 Power Supply low voltage conduit, wire, and connections		X							X					
Division 08 Lockset Wiring and connections between Locksets and Door Frame Transfer Device	X							X						
Division 08 Door Hardware Wire Harnesses From Door Frame Transfer Device to Junction box	X								X					
Division 08 Door Hardware Frame and Door Preparations	X							X						
Division 08 Door Hardware Conduit Connections to Frame Preparation		X							X					
Division 08 Door Hardware Wiring Connections to Junction Boxes and Controlling Equipment		X							X					
Division 08 Door System Operators	X							X						
Division 08 Pneumatic Door Operator Systems	X							X						
Division 08 Overhead Doors Integral Control Systems & Push Button Wiring	X							X						
Division 08 Overhead Doors Power & Final Connection		X							X					
Exit signals for Operator Actuators and Card Readers	X							X						
Drain Lines and Weeps for Door Hardware Recessed in Floors	X							X						
Glazed System Frame and Door Preparations	X							X						
Card Reader Conduit to all Div. 08 Operators and Locksets		X							X					
Card Readers and wiring to all Operators		X							X					
Division 08 Fire Alarm Interface including conduit, wiring, relays, and connections		X							X					
Hardware layout and door and frame preparations on existing doors and frames.	X							X						
Door hardware not specified in division 08 is to be provided by designated Prime as designated in Division 01 12 00.														
Knox Box	X							X						
Knox Box (Low Voltage Wiring)		X							X					
Division 11 Parking Control Equipment Power Requirements									X					
Building Automated Controls System Interface														
24 hour Remote Monitoring System using permanent HVAC systems for temporary usage.			X							X				
Line Voltage Surge Protection devices			X							X				
Transient Voltage Suppression devices			X							X				
BACnet conduit, wiring, and connections to Lighting controls & Occupancy systems			X							X				
			X							X				
BACnet conduit, wiring, and connections to Rain Water Harvesting System			X							X				
BACnet equipment interface to Rain Water Harvesting Systems			X							X				
BACnet monitoring conduit, wiring, and connections to Motorized Shade Systems			X							X				
Power connections to Motorized Shade Systems per the Electrical Drawings		X							X					
Fire Alarm Interface to BAS including conduit, wiring, relays, modules, and connections.		X							X					
Access Control interface with Building Automated System			X							X				
Lighting Controls System & Motorized Shades														
Lighting Controls interface connections to Motorized Shades		X							X					
Power distribution to Motorized Shade Systems	X							X						
Communications Systems - Site														
Division 27 Site Communications - Outside Plant (OSP)		X				X			X					X
Division 27 Site Communications - OSP Cabling						X								X
Division 27 Site Communications - OSP Terminations						X								X

01 12 00 - 19

2.0 GENERAL CONSTRUCTION CONTRACT

The work of the General Construction Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the drawings and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes and governing jurisdictions.

<u>Specifications</u>	<u>Description</u>
a. Division 00	Procurement and Contract Requirements
b. Division 01	General Requirements
c. Division 02	Existing Conditions
d. Division 03	Concrete
e. Division 04	Masonry
f. Division 05	Metals
g. Division 06	Wood, Plastics, and Composites
h. Division 07	Thermal and Moisture Protection
i. Division 08	Openings
j. Division 09	Finishes
k. Division 10	Specialties
l. Division 11	Equipment
m. Division 12	Furnishings
n. Division 14	Conveying Equipment
o. Division 31	Earthwork
p. Division 32	Landscape
q. Division 32	Exterior Improvements
r. Division 33	Utilities

1. With in (15) days of notice to proceed, the General Contractor Prime is to submit all shop drawings for long lead materials pertaining to the exterior façade for review.
2. The Contractor and its demolition contractors has visited the site and reviewed all areas of disturbance related to work of this bid package. Any existing improvements that require removal, demolition, relocation and/or protection to perform the work are considered part of this Contractors scope of work.
3. Any demo / building permits will be applied and paid for by the GC Prime. This will be a pass-through cost (no mark-up) to the County, and a change order will be issued to reimburse the cost.
4. The building is empty of all owner furnishings for the start of this phase of construction.
5. Provide ALL interior and exterior demolition indicated or required on the contract documents including, but not limited to, all Architectural, Civil and MEP demolition. Exterior skin demolition includes, but is not limited to, brick, block back up, framing, window systems, brick angles, brackets, coping, fixtures, relief angles and relief angle supports, and miscellaneous items

attached to the exterior walls. It is understood that all demolition work by this contractor is required for the new work by this contractor.

6. General Construction Prime will remove all Mechanical, Electrical, Plumbing and Fire Protection demoed material which has been disconnected and dropped to a centralized location in the building. Contractor to include the removal of the existing generator on the 2nd floor.
7. Contractor will demo and remove old phone equipment and associated wiring.
8. Remove the existing first floor dry fire protection system piping. Compressor and pump associated with this system to be demolished by the GC Prime.
9. Provide all floor and elevated slab infill and patching resulting from any previously demoed pipe and duct penetrations or scheduled pipe and duct removal. This includes storm piping penetrations.
10. Provide all roof deck infill per the shown detail on the contract documents for existing penetrations and scheduled penetration related to demolition.
11. Demo and remove existing elevators and all associated elevator equipment as part of your work.
12. Include patching of any portions of the elevator shaft scheduled to remain after removal of elevator equipment, utilities and related materials. Patch prior to elevator installation.
13. Include all elevator shaft wall embeds with new elevator equipment installations.
14. Reference Logistics Plan for proposed dumpster locations. **Note dumpsters cannot be located under the covered the parking area or inside the loading dock garage.**
15. Lead paint surfaces were tested during environmental survey and came back below required levels. If any lead paint surfaces are discovered during demolition and new construction, Contractor will take necessary measures to protect its workers, workers of other Contractors and the public from lead dust exposure when demolishing, cutting, abrading, burning of drilling into painted surfaces.
16. In the event unknown suspected hazardous materials are uncovered during the course of the work, all workers shall stop work and notify the CMA and owner. The CMA will arrange for testing of materials uncovered that are not represented in the environmental assessment. Removal of unforeseen hazardous materials will be compensated for based on established unit prices.
17. GC Prime to secure the building at the end of each day.
18. It is the responsibility of this prime contractor to secure all tools, equipment and material stored on site at the end of each workday.
19. Dedication tree and plaque are to be removed, stored and replanted where shown at appropriate planting season. GC prime to hire an Arborist and store tree at a local nursery.



20. Reference the site logistics plan provided with this bid package. Should contractor utilize means and methods outside the library property line, contractor will submit to the authority having jurisdiction, any permits and / or costs associated related to the temporary logistics, including, but not limited to, sidewalk closure, lane closures and any other permits required related to logistics.
21. Contractor is required to provide and use 8-foot-high panel temporary fencing with sandbags and Yodock barriers with fence panels to secure the jobsite with gates. Yodock fence assemblies shall be installed at Swede Street and along paved and sidewalk areas where snowplows will come into contact. Utilize water filled Yodock 2001 24" W x 72" L x 46"h Barriers with fence panels and fence couplers (4 per panel) manufactured by Yodock or equal. Include post stabilizers, grommets, barrier couplers and corners. Overall height of fence and barrier not less than 96". Contractor is required to utilize PA One Call and Ground Penetrating Radar and Electromagnetic locator services to ensure safe installation of fencing. Refer to logistics plan. Existing rolling gates can be utilized during construction for additional security. General Contractor Prime is responsible for ensuring the fence is closed and weighted at all points at the end of each day.
22. Contractor is responsible for providing temporary protection of the building which includes but is not limited to temporary door access points, window openings, sections of the building not finished which may include exterior walls and roof openings.
23. Contractor is responsible for temporary heat and conditioning of the building if work is scheduled by this contractor which requires specified climatized spaces ahead of scheduled weather tight milestone date.
24. Contractor will provide and maintain safe roof access for all Contractors use.
25. The GC Prime Contractor will provide fall protection at the roof level, perimeter of each floor and at deck openings for use by all trades.
26. Protect and repair any damaged roofing because of construction activities. Provide roof protection at any location where materials will be transported from mechanical room roof access to the roof. GC is to maintain temporary ramp access at the mechanical room roof access location left from previous work.
27. Contractor will maintain all stair towers unobstructed for the duration of the work. Elevators will not be in service.
28. Contractor will avoid excessive loading on elevated decks. Remove debris without letting it accumulate on floors. If contractor intends to utilize equipment on elevated decks (scissor lifts, bobcat, skid steer, tow motor), their structural engineer must evaluate the live and dead load imposed by the equipment and confirm it's use is not detrimental to the structure.
29. GC Prime is to provide and maintain inspections for (10) Ten 20# multi use fire extinguishers for disbursement on each floor and roof level. Mount extinguishers on temporary stanchions or existing construction.

30. The GC Prime to contract the pruning of any existing to remain trees to allow for construction equipment clearance. The GC Prime is to hire an arborist to supervise any pruning.
31. Some trees may require lower-branch pruning to allow for the operation of construction equipment. It may be necessary to prune to a height of 15' or more to allow for clearance of construction vehicles. Trained personnel should do a pre-construction pruning. All work performed by pruning crews should be under the supervision of a certified Arborist. GC Prime to provide temporary protection around existing trees to remain during construction. GC Prime to provide watering and maintenance for new landscaping on until substantial completion and turnover to the Owner.
32. EC Prime Contractor will maintain temporary power and lighting left after Phase 1 construction. EC Prime will adjust and move interior temporary power and lighting during construction until permanent power and lighting have been installed and energized. EC Prime will remove temporary power and lighting.
33. Provide dust protection and containment during construction. Follow OSHA guidelines for working with, and exposure to, crystalline silica. Protect workers and the public from exposure to crystalline silica during exterior demolition work and any work that could produce airborne silica dust.
34. Contractor will provide DAILY Clean-up for its work and workers and that of its Subcontractors. Provide dumpsters for legal disposal and recycling of trash and debris. Dumpsters provided by the GC Prime Contractor will be used by all Prime Contractors. Reference logistics plan for proposed dumpster location
35. Contractor will padlock and secure all gates and building entrances at the end of each shift. Provide temporary exterior doors and cover window openings at grade for security. Provide 10 keys for locks to CM. GC must keep the building secure off hours.
36. GC Prime Contractor will provide and maintain portable temporary sanitary facilities and hand washing stations with water for use by all Contractors and workers onsite. Provide soap, and disposable towels at hand wash stations. Portable toilets are to be cleaned and sanitized a minimum of two times a week. Provide sufficient items described to support the number of workers on site.
37. All temporary construction provided by this contractor will be maintained, modified if necessary and removed when directed.
38. Contractor is to provide and maintain temporary access to all levels of the building including the roof which meet standard OSHA requirements.
39. Contractor will provide all snow removal throughout the duration of the project. This includes parking areas, walks, office trailer and building entrance areas to provide safe slip resistant access to the building.

40. Contractor will provide and maintain all lawn mowing on a regular basis to ensure there is no overgrowth of grass and weeds in the yards, parking lot and along the fence line, sidewalks and neighborhood property lines.
41. Contractor is to review and confirm if there are any abandoned underground propane tanks and assemblies in the yard / sidewalk area under the dual manholes at Spring and Grady Alley. Excavate, remove buried propane tanks and backfill.
42. Contractor should assume a 6" depth for Walker Duct trench infill. Contract documents, 3/S3.3 shows +/- 3 1/4".
43. Contractor is required to provide new base scope spray fireproofing on all new structural steel and existing steel throughout the building per the contract documents. Provide overspray protection for your work. Overspray protection includes but is not limited to protecting other prime contractor's treaded rods and hangers installed for their work. All existing spray fireproofing is to be removed by this contractor so the steel is exposed in order to create a proper bond between new spray fireproofing and the steel. Contractor is to safely remove and dispose of the existing spray fireproofing via mechanical means and power washing.
44. Contractor is responsible for all in wall wood blocking on the project. Blocking requirements are based on all contract documents including but not limited to architectural, mechanical, electrical, plumbing, fire protection, audio-visual and interiors plans. GC Prime to include Fire-Rated plywood backing for all Electrical / Low-Voltage panels.
45. Contractor is responsible for providing all miscellaneous steel required for supports and opening including but not limited to overhead toilet partition supports, handrails, guardrails and loose lintels for new openings.
46. The construction of exterior walls, elevator shafts, stair towers, electrical rooms, tele/data rooms, mechanical rooms, IDF rooms, mechanical shafts and other specialty rooms will progress ahead of the interior floor fit-out. Construct the rooms described immediately following **Spray-Applied Fire-Resistive Material (SFRM) on each level**. The General Construction Contract will provide mildew resistant drywall and mildew resistant shaft liner at these locations. Only the inside of these rooms will be drywalled and finished to allow other trades to install their work. Coordinate with all Contractors.
47. Provide sealants and fire stopping related to work installed as part of this bid package. Firestopping materials will be single source. Coordinate with all Contractors and select one Manufacturer for all firestopping materials.
48. Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing steel construction passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.
49. The General Contractor prime is required to participate in MEP coordination and utilize approved reflective ceiling shop drawings in this process.

50. Coordinate interior partition construction with the MEP Contractors. Identify the sequence of partition construction, top out and fire stopping. Identify walls that must be constructed prior to the installation of overhead MEP systems.
51. The General Construction Prime will be responsible to provide and maintain control lines for use by all contractors. After the interior demolition is complete, survey the building to determine if the exterior walls are parallel and the building is square within itself. Inform the CMa and architect of any discrepancies.
52. Include flash patching and skim coating floors for installation of flooring materials and at exposed concrete floors. This includes exposed concrete floors in the basement. All existing and new concrete slabs are to be skim coated to achieve a level, uniform finish. Minimum thickness of coating is 1/8".
53. Cut temporary steel stanchions below the floor level and patch floor flush.
54. Contractor is to survey the existing floor slabs and include all costs associated with patching and infilling holes in the slabs. This includes but is not limited to core holes, abandoned duct penetrations and trenches. Refer to slab details in the contract documents for repair methods.
55. Contractor is to survey the existing CMU block walls on all floor levels and include all costs associated with infilling and patching holes left in the walls. This includes but is not limited to removed pipes, conduits and ducts openings.
56. Contractor will saw cut and patch sections of existing CMU wall at the 2nd floor, column line 16 which will remain. This is the wall separating Mechanical 229 and Storage 217.
57. Provide all layout for use by all contractors. Layout on the floor, finish walls, openings, soffits and built in items. After the interior demolition is complete, survey the building to determine if the exterior walls are parallel and the building is square within itself. Inform the CMa and architect of any discrepancies.
58. Access Panels will be furnished by each Prime Contractor for installation by the General Constructor Prime. Assume (5) Five access panels will be provided by each Prime Contractor. General Contractor will provide and install all wall and ceiling access panels shown on the architectural documents. The General Construction Contract will include layout, framing, blocking and finishing for the installation of access panels.
59. Equipment pad shown on the drawings are to be included by the GC prime. Any housekeeping pads not shown on the drawings but required will be installed by that associated prime contractor.
60. General Contractor Prime is required to provide and install a Know Box if required per the AHJ. Coordinate with the City Fire Marshall for model and specifications. EC Prime is required to provide any associated wiring if required.

61. General Contractor Prime is required to paint all mechanical equipment shown to be painted or called out on the contract documents.
62. Curtainwall testing is required. The 3rd party testing agency will conduct air and water infiltration testing. Please refer to the product specifications.
63. Book drop shown in the Civil Drawings is furnished by the owner and is to be installed by Contractor.
64. Contractor to Power Wash, scrub clean all site retaining walls and building retaining walls scheduled to remain around the parking area. Prep for paint.
65. Contractor to provide construction final cleaning.

2.1 ELECTRICAL CONTRUCTION CONTRACT

The work of the Electrical Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

<u>Specifications</u>	<u>Description</u>
a) Division 00	Procurement and Contract Requirements
b) Division 01	General Requirements
c) Division 02	Existing Conditions
d) Division 03	Concrete (as it applies)
e) Division 07	Thermal and Moisture Protection (as it applies) <i>including but not limited to:</i>
(i) 078413	Penetration Fire Stopping
(ii) 079200	Joint Sealants
f) Division 08	Openings (as it applies) <i>including but not limited to:</i>
(i) 080671	Door Hardware Schedule
(ii) 081500	Integrated Access Control Hardware Devices
(iii) 083323	Overhead Coiling Doors
(iv) 083326	Overhead Coiling Grilles
(v) 084229.23	Sliding Automatic Entrances
(vi) 087100	Door Hardware
(vii) 087113	Power Door Operators
g) Division 09	Finishes (as it applies) <i>including but not limited to:</i>
(i) 092100	Gypsum Board Assemblies

h)	Division 10	Specialties (as it applies) <i>including but not limited to:</i>
	(i) 101200	Display Cases
	(ii) 101419	Dimensional Letter Signage
	(iii) 103341	Operable Partition
i)	Division 11	Equipment (as it applies) <i>including but not limited to:</i>
	(i) 111200	Parking Control Equipment
j)	Division 14	Conveying Equipment (as it applies) <i>including but not limited to:</i>
	(i) 142400	MRL Hydraulic Elevators
k)	Division 26	Electrical
l)	Division 27	Communications
m)	Division 28	Electronic Safety and Security
n)	Division 31	Earthwork (as it applies)
o)	Division 33	Utilities (as it applies)
p)	Appendix	Project: ii-3641 Norristown Public Library - Cutsheet Package

<u>Related Sections</u>	<u>Description</u>
a. Division 14	Conveying Equipment
b. Division 21	Fire Suppression
c. Division 23	Heating, Ventilation, and Air-Conditioning
d. Division 25	Integrated Automation
e. Division 04	Masonry
f. Division 05	Metals
g. Division 06	Wood, Plastics, and Composites
h. Division 12	Furnishings
i. Division 32	Landscape
j. Division 32	Exterior Improvements

1. Contractor will include all electric and low voltage work including pathways, back boxes, junction boxes, conduits, and wire. Refer to matrix included at the end of electrical scope.
 - a. Electrical work shown and or specified and as required for a complete electrical system installation.
 - b. Communications: All work shown and or specified. Final punch down and installation of actual equipment will be by others.
 - c. Electronic Safety and Security work shown and or specified and as required for a complete installation.
 - d. Electrical Low Voltage, Data and AV as shown to provide a complete system.
 - e. Security camera system, cabling and installation by EC Prime.
 - f. Knox Box power and cabling if required is by EC Prime. GC Prime will provide and install Knox Box.
 - g. Contractor is required to attend pre-work meetings with GC Prime's Elevator Subcontractor. Contractor is required to provide coordinated power to the elevators.

- h. Contractor will participate in owner / vendor IT coordination meetings to fully coordinate an integrated building system to include but not be limited to IT, Fire Alarm, Security, BAS and Library Equipment.
 - i. Contractor is responsible for any power and wiring to the Fire Protection system interface.
 - j. Contractor is responsible for all power to mechanical equipment.
 - k. Electric Vehicle Chargers (EV) shown on the documents are to be provided and installed by the Electrical Prime Contractor. Quantity is (2) chargers. Quantity of (6) shown on E1.3b is incorrect.
- 2. Investigate and make familiar all electrical panels and equipment left active after Phase 1 of construction. Temporary lighting was left in place after Phase 1. EC Prime will adjust and move interior temporary power and lighting during construction until permanent power and lighting have been installed and energized. Contractor is responsible for removal of all temporary lighting and power on the project when complete.
- 3. This EC is responsible to Confirm with the utility company the status of the Transformer provided by PECO.
- 4. Any electrical building permits are to be applied and paid for by the EC Prime. This will be submitted as a pass-through cost (no mark-up) and a change order will be issued to reimburse the cost.
- 5. EC Prime Contractor to subcontract with an AV vendor for all equipment installation, testing and owner training.
- 6. Contractor is responsible for providing a coordinated shop drawing and attending the concrete foundation pre-work meeting so all MEP sleeves and stub-ups can be located and coordinated for a proper installation.
- 7. Provide a minimum of (3) three Internet company feeder conduits with pull strings from building / street demarcation line to IDF closet. This included ground level or overhead service provider requirements.
- 8. Electrical Prime Contractor to coordinate with General Contractor Prime Contractor for the installation of all electrified door hardware. The EC Prime is to provide power and final connections associated with door hardware at each scheduled opening.
- 9. Electrical Prime Contractor is responsible for Cutting, coring and patching required for your work.
- 10. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate size and layout with the GC. Any bases, pads, handholes, or vaults needed for your installation not shown on the drawings will be included in this bid package.

11. Contractor is responsible for excavation, backfilling and one-call for electrical work.
12. Contractors will coordinate overhead MEP and Fire Protection rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.
13. This prime to participate in above ceiling coordination lead by the MC Prime Contractors will coordinate overhead MEP and Fire Protection rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.
14. Contractor will include the cost of any standby non-work observed only holidays. This cost would cover a fire watch electrician to be onsite when others are working during normal scheduled workdays.
15. Contractor will provide DAILY Clean-up for its work and workmen and that of its Subcontractors. The GC Prime Contractor will provide dumpsters.
16. It is the responsibility of this prime contractor to secure all tools, equipment and material stored on site at the end of each workday.
17. Contractors will reference OSHA requirements related to working with lead and lead painted materials. Contractor will take necessary measures to protect its workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning or drilling into painted surfaces.
18. Provide the complete fire detection and fire alarm system as indicated in the documents.
19. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.
20. Within 15 days of notice to proceed, contractor will submit shop drawings and product information for all electric panels, gear, generator and other long lead equipment.
21. The existing temporary electrical service to the limit provided is available for temporary power and lighting.
22. Contractor is responsible for conducting a site survey of the existing to remain electrical equipment, panels and feeders to confirm the existing conditions at the start of construction. Abandoned raceways and or conduits should be removed as part of the new service installation. Maintain a code complaint system.

23. Electrical gear located in the mechanical room will remain energized and be part of this Phase 2 demolition.
24. Contractor is responsible for disconnecting existing gear and generator to safe off for the GC Prime to remove when required by the project schedule. Equipment is to be unfastened and dropped to a central location for GC Prime to remove.
25. Contractor is responsible for coordinating with the other Primes the timing of the demolition and termination of existing power for the new PECO transformer and gear scheduled for installation and energization.
26. Contractor to disconnect and drop to a centralized location in the building all MEP equipment being demoed. GC Prime to remove.
27. Switch over of the temporary service to the permanent service shall be at a time so as not to affect the on-going construction activities. There will not be additional compensation if conditions require that switchover be performed on overtime.
28. Contractor will provide the interim maintenance of the new permanent electrical equipment during the construction, startup and commissioning periods until acceptance by the Owner. This Contractor will include all extended warranties for equipment used, started and operating prior to Owner acceptance. Maintenance records shall be kept during this period and turned over to the CMA upon request. At a minimum, permanent electric systems will be used for the following prior to substantial completion. Warranties commence on the date of substantial completion.

Light and power during construction

Elevator electrical power- temporary and permanent

Permanent HVAC equipment used for temporary heat, cooling, and ventilation.

Early startup of systems for testing and commissioning

29. Reference the milestone date in the project schedule for startup of permanent HVAC equipment and systems for the use of temporary conditioning. Contractor must provide permanent power for early start-up of all equipment needed for temporary conditioning.
30. Contractor will operationally test the Fire Alarm System prior to AHJ Inspection. This test shall be witnessed by the CMA. The fire alarm system and integration with the fire protection system must be completely operational and pre-tested prior to scheduling the AHJ inspections. Provide labor to assist with all AHJ inspections.
31. Contractor will install and make final connections to the Owner furnished equipment.
32. Contractor will utilize the Owner required cabling colors as listed:

- a. White (Shielded) - TV
 - b. Black – VOIP Communications / Phones
 - c. Blue – Public & General Use
 - d. Green – ISS Cameras, Access Controls & Keypads
 - e. Grey – Old Legacy
 - f. Orange – WAPs
 - g. Purple – ILO / DRAC Remote Connectivity
 - h. Red – Clustering Heartbeat, Cross Over Cabling
 - i. Yellow – Backchannel / Private Connectivity
33. Include a complete cleaning of all electrical panels, meter, gear, transformers and generator prior to final acceptance.
34. Provide sealants and fire stopping related to work installed as part of this bid package. Firestopping materials will be single source. Coordinate with all Contractors and select one Manufacturer for all firestopping materials.
35. Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing electrical pipe and conduits passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.
36. The GC Prime Contractor will paint all MEP lines scheduled to be painted. Mark out and identify lines to be painted.
37. Provide floor, wall and ceiling access panels for work related to this bid package. Access panels to be installed by General Contractor Prime.
38. The existing fire alarm systems have been deactivated in Phase 1.
39. Contractor is responsible for providing and installing all floor boxes and pigtails for power and low voltage requirements. Installation is to be fully coordinated with the other trades.
40. Contractor is responsible for layout and core drilling for a safe installation. Active electric is contained in the slabs.
41. Contractor is to provide a working, tested and certified generator prior to elevator start-up and state certification.
42. Contractor to provide all jobsite offices with temporary power hook-up and energization. EC Prime is responsible for providing temporary poles necessary of installation temp office power. Schedule and coordinate PECO service agreement. Owner to pay for energy usage. Refer to logistics plan for office location and size.
43. Contractor to provide heat trace for office trailer temporary water service and site entrance tire wash equipment. Refer to logistics plan for office and entrance location.

44. Contractor will provide and maintain a temporary power and lighting services to satisfy OSHA, NFPA, NEC and AHJ requirements.

- a. Provide Temporary Power: (8) quad outlets on each of floors 1 & 2. Provide (2) quad outlets at the ground floor of Career Links office area. Provide temporary lighting at the ground floor area. Provide GFCI protected breakers in the panels for temporary power. All wiring is to be exposed.
- b. Consumption costs will be paid by the county to the utility company.
- c. Provide LED fixtures and bulbs for all temporary lighting.
- d. Remove temporary power and lights when no longer needed based upon the completion of permanent systems.

2.2 HEATING, VENTILATING, AND AIR CONDITIONING (HVAC) CONTRACT

The work of the HVAC Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

<u>Specifications</u>	<u>Description</u>
a) Division 00	Procurement and Contract Requirements
b) Division 01	General Requirements
c) Division 2	Existing Conditions
d) Division 07	Thermal and Moisture Protection (as it applies) <i>including but not limited to:</i>
I) 078413	Penetration Fire Stopping
II) 079200	Joint Sealants
e) Division 23	Heating, Ventilating, and Air-Conditioning (HVAC)

<u>Related Sections</u>	<u>Description</u>
a) Division 22	Plumbing
b) Division 25	Integrated Automation
c) Division 26	Electrical
d) Division 28	Fire Alarm

1. The General Construction Prime Contractor will provide all mechanical demolition indicated.
2. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule. Provide a list of all known long lead material and equipment items.

3. Any demo / HVAC permits will be applied and paid for by the MC Prime. This will be a pass-through cost (no mark-up) to the County, and a change order will be issued to reimburse the cost.
4. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CMA of any issues related to ceiling heights or overhead rough-in prior to installation. Contractor will lead and establish a process for above ceiling MEP and Fire Protection coordination with the other primes.
5. Coring, cutting and patching required for your work will be performed as part of this bid package.
6. Contractors will reference OSHA requirements related to working with lead and lead painted materials. Contractor will take necessary measures to protect its workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning or drilling into painted surfaces. Assume all painted surfaces contain lead.
7. Contractor to disconnect and drop to a centralized location in the building all MEP equipment being demoed. GC Prime to remove.
8. Contractor will include all hot and cold refrigerant lines, condensate lines, controls and equipment for a complete operational system. Not all piping sizes and distribution are shown on the drawings. Coordinate piping distribution and sizes with the equipment manufacturer.
9. Contractor is responsible for including all sheet metal drain pans including piping outlet penetrations and nipple. Drain pans are to be pre-engineered or custom fabricated based upon equipment sizing requirements. The final connection to the drain pans, all condensate piping, leak detection module, wiring, and sensors will be this contractor. Leak detection alarm wiring to the Building Automation System (BAS) is by the HVAC Construction Contract.
10. Contractor is responsible for providing and installing Rooftop Unit Screens attached to the units per the contract documents. Coordinate with the GC Prime.
11. Coordinate equipment start-up, both temporary and permanent, with Electrical Prime Contractor and the CMA.
12. Provide and maintain temporary heating, cooling, ventilation, and dehumidification using permanent systems for the installation of architectural finishes. Reference the bid schedule for dates related to temporary startup of permanent systems for temporary use. Contractor will have the systems in temporary operation by this date.
13. For the use of temporary HVAC during construction, develop a methodology for moving air throughout the building to distribute heating, cooling, ventilation, and dehumidification, using permanent, and if necessary, temporary ductwork to provide adequate distribution of conditioned air.

14. Contractor will protect (via temporary filter media) all return ducts, air handling equipment, outside air plenums/louvers, and return registers during construction and during periods of operating the air handling units and equipment for temporary use. Contractor shall change and/or clean filters as required for project duration. Cost of filter changes is included in this contract. Filters are not to be pulled from the attic stock quantity.
15. It is the responsibility of this prime contractor to secure all tools, equipment and material stored on site at the end of each workday.
16. Contractor will provide means to remotely monitor the equipment operation that will provide notification if the equipment is not functioning properly. Contractor will respond to trouble shoot equipment operations. This applies to equipment in operation for temporary use.
17. Contractor will provide the interim maintenance of the equipment during construction, startup, temporary usage and commissioning periods until acceptance by the Owner. This Contractor includes all extended warranties required for equipment used, started and operating prior to Owner acceptance. Maintenance records shall be kept during this period and turned over to the CMA upon request. The warranty period starts at Substantial Completion of the Project.
18. Upon substantial completion, or as directed by CMA, this contractor will provide a complete cleaning of the entire mechanical systems. Contractor will provide filter changes for all equipment immediately prior to Owner final acceptance. Filters will be new and not from attic stock.
19. Reference reflected ceiling plans for locations of exposed to structure ceilings. Contractors will avoid installing systems in those locations when possible. All systems, piping, duct conduit and cabling serving the open ceiling areas is to be run neatly and in straight lines.
20. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate size with the GC and provide layout. Any bases or pads needed for your installation not shown on the drawings will be provided by this bidder.
21. Contractor is responsible for providing a coordinated shop drawing and attending the concrete foundation pre-work meeting so all MEP sleeves and stub-ups can be located and coordinated for a proper installation.
22. Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing ductwork, mechanical pipe and conduit lines passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.
23. Provide floor, wall and roof penetration sealants and fire stopping related to work installed as part of this bid package. Firestopping materials will be single source. Coordinate with all Contractors and select one Manufacturer for all firestopping materials.
24. The GC Prime Contractor will paint all MEP lines scheduled to be painted. Mark out and identify lines to be painted.

25. Provide floor, wall and ceiling access panels for work related to this bid package.
26. Contractor will provide DAILY Clean-up for its work and workmen and that of its Subcontractors. The GC Prime Contractor will provide a dumpster for contractors use.

2.3 PLUMBING CONSTRUCTION CONTRACT

The work of the Plumbing Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, quipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

<u>Specifications</u>	<u>Description</u>
a. Division 00	Procurement and Contract Requirements
b. Division 01	General Requirements
c. Division 02	Existing Conditions
d. Division 03	Concrete (as it applies)
e. Division 07	Thermal and Moisture Protection (as it applies) <i>including but not limited to:</i>
i. 078413	Penetration Fire Stopping
ii. 079200	Joint Sealants
f. Division 09	Finishes (as it applies) <i>including but not limited to:</i>
i. 092100	Gypsum Board Assemblies
g. Division 22	Plumbing
h. Division 31	Earthwork (as applies)
i. Division 33	Utilities (as it applies)

<u>Related Sections</u>	<u>Description</u>
a. Division 23	Heating, Ventilating, and Air-Conditioning (HVAC)
b. Division 25	Integrated Automation

1. The General Trades Prime Contractor will perform all plumbing demolition indicated.
2. The GC Prime will bring temp water to the site from the existing building meter location. Provide temp water to construction trailers and tire wash. Refer to site logistics plan.

3. Provide temp water for the building from the valve provided in Phase 1 near Column Line 4.2. Provide a temporary laundry tub for hand washing only for use by all prime contractors in a location close to the water supply but not interfering with construction work.
4. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.
5. This prime to participate in above ceiling coordination lead by the MC Prime Contractors will coordinate overhead MEP and Fire Protection rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.
6. Contractor is responsible for providing a coordinated shop drawing and attending the concrete foundation pre-work meeting so all MEP sleeves and stub-ups can be located and coordinated for a proper installation.
7. Any demo / plumbing permits will be applied and paid for by the PC Prime. This will be a pass-through cost (no mark-up) to the County, and a change order will be issued to reimburse the cost.
8. Site sanitary and site storm underground will be installed by the GC Prime Contractor to a flanged connection inside the first-floor foundation wall. This Bidder will complete the plumbing systems inside the building.
9. All new utilities will be brought into the building to the first flange by the civil subcontractor.
10. All below grade storm piping demo on the first floor is to be completed by this prime. Include saw-cutting, concrete removal, excavation, removal of pipe, installation of new pipe, backfill and concrete infills. Include stone and or clean fill if needed or removal any excess spoils from site.
11. Contractor to disconnected and drop to a centralized location in the building all MEP equipment being demoed. GC Prime to remove. Any storm piping demo on floors 2 or 3 can be cut and dropped to floor to be removed by the GC prime.
12. Coordinate storm piping removal with roof demo. Provide temp storm drainage as needed.
13. It is known that PAAW will be upgrading the water main along Swede Street. Determine if a water booster pump is required after flow test. See Alternates Specification Section.
14. The new gas service is at a different location from the existing gas service. The current gas meter is locked out by PECO. Include disconnecting the gas line past the meter and cap the outlet for demolition by others. The gas meter will be removed by the utility company. Coordinate with CMa and PECO regarding new service.
15. It is the responsibility of this prime contractor to secure all tools, equipment and material stored on site at the end of each workday.

16. Contractor will provide DAILY Clean-up for its work and workmen and that of its Subcontractors. The GC Prime contractor will provide a dumpster on site for contractor's use.
17. Concrete housekeeping pads and concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate with the GC size and provide layout. Any bases or pads needed for your installation not shown on the drawings will be provided as part of this bid package.
18. Provide cutting, coring and patching related to the work of this bid package.
19. Contractors will reference OSHA requirements related to working with lead and lead painted materials. Contractor will take necessary measures to protect its workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning or drilling into painted surfaces. Assume all painted surfaces contain lead.
20. Provide sealants and fire stopping related to work installed as part of this bid package. Firestopping materials will be single source. Coordinate with all Contractors and select one Manufacturer for all firestopping materials.
21. Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing plumbing pipe and lines passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.
22. Furnish floor, wall and ceiling access panels for work related to this bid package. Installation of access panels to be installed by the GC Prime.
23. The GC Prime Contractor will provide new sump pits in the basement shown on the Plumbing drawings. Coordinate Plumbing work with the GC Prime Contractor.
24. Provide under slab plumbing, saw cutting slab on grade, excavation, backfill and floor patching.
25. The GC Prime Contractor will paint all MEP lines scheduled to be painted. Mark out and identify lines to be painted.

2.4 FIRE PROTECTION CONSTRUCTION CONTRACT

The work of the Fire Protection Prime Contract Package includes, but is not limited to, the Work detailed by the following specification sections, as shown, implied and/or indicated on the documents provided and as described in the contract description. The work is not restricted by the division of drawings or specification. Unless otherwise specifically noted, all work to be performed shall consist of providing all labor, materials, equipment and other necessary requirements to complete the work in accordance with the specifications and applicable codes.

<u>Specifications</u>	<u>Description</u>
a. Division 00	Procurement and Contract Requirements
b. Division 01	General Requirements

- c. Division 02 Existing Conditions
- d. Division 07 Thermal and Moisture Protection (as it applies)
including but not limited to:
 - i. 078413 Fire Stopping
 - ii. 079219 Joint Sealants
- e. Division 21 Fire Suppression

<u>Related Sections</u>	<u>Description</u>
a) Division 28	Electronic Safety and Security

1. Protect existing standpipes and pumper connection as required / determined by local AHJ. Provide and maintain Temporary Fire Protection as described in the Temporary Facilities and Controls Section 01 15 00. Coordinate with Norristown Fire Marshal for installation and requirements. If required, install within 60 days of NTP.
2. Contractor will expedite material and equipment submittals focusing on long lead items needed to meet the installation dates identified on the project schedule.
3. Any demo / fire protection permits will be applied and paid for by the FPC Prime. This will be a pass-through cost (no mark-up) to the County, and a change order will be issued to reimburse the cost.
4. Submit fire pump shop drawings, product information associated equipment for the fire pump within 15 days of notice to proceed.
5. Contractors will coordinate overhead MEP rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.
6. This prime to participate in above ceiling coordination lead by the MC Prime Contractors will coordinate overhead MEP and Fire Protection rough-in, wall construction and ceiling framing to assure the ceiling heights indicated on the contract drawings are maintained. Notify the CM of any issues related to ceiling heights or overhead rough-in prior to installation.
7. Contractor is responsible for providing a coordinated shop drawing and attending the concrete foundation pre-work meeting so all MEP sleeves and stub-ups can be located and coordinated for a proper installation.
8. It is known that PAAW will be upgrading the water main along Swede Street. Determine if a sprinkler booster pump is required after flow test. See Alternates Specification Section.
9. Contractor to disconnect and drop to a centralized location in the building all MEP equipment being demoed. GC Prime to remove.

10. The GC Prime Contractor will install the site fire water service to a capped flange connection inside the basement wall. Include connection and fire water distribution from that point. Flush, treat and sanitize the entire system.
11. Coordinate all flushing and filling, pre-testing and testing with the Electrical Prime Contractor. If fire alarm system is impacted, flush and fill, pre-testing and testing requests shall be made 72 hours in advance notice to the Electrical Prime, CMA, and Owner
12. Concrete housekeeping pads or concrete curbs shown on the drawings will be provided by the GC Prime Contractor. Coordinate and provide layout for shown concrete pads and curbs. Any bases or pads needed for your installation not shown on the drawings will be provided by this bidder.
13. The GC Prime Contractor will paint all MEP lines scheduled to be painted. Mark out and identify lines to be painted.
14. Provide cutting, coring and patching for work related to this bid package. Contractors will reference OSHA requirements related to working with lead and lead painted materials.
15. Contractor will take necessary measures to protect its workers, workers of other Contractors and the public from lead dust exposure if cutting, abrading, burning of drilling into painted surfaces. Assume painted surfaces contain lead.
16. Provide sealants and fire stopping related to work installed as part of this bid package. Firestopping materials will be single source. Coordinate with all Contractors and select one Manufacturer for all firestopping materials.
17. Contractor is responsible for reviewing all existing and new wall construction in the building for code compliance as related to but not limited to fire rating, sound rating, air barrier. Review all new and existing fire protection pipe and lines passing through CMU block and drywall walls to install code complaint firestopping and caulk sealants based on the required wall rating.
18. Contractor will provide DAILY Clean-up for its work and workmen and that of its Subcontractors. The GC Prime Contractor will provide dumpsters for contractors use.

SECTION 01 21 00 - ALLOWANCES**PART 1 - GENERAL****1.1 SUMMARY**

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. 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. Allowances are to be used at the sole discretion of the Owner. Any unused allowance will be credited back to the Owner via a deduct change order.
 - 2. Contractor Markup: Prime contractors are not allowed mark up on labor, material and/or equipment when allowances are used. Sub-tier contractors are allowed mark ups consistent with the Owner contract.
- C. Types of allowances include the following:
 - 1. Contingency allowances.
- D. Related Requirements:
 - 1. Section 01 22 00 "Unit Prices" for procedures for using unit prices.

1.2 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. As applicable and at CMA's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

1.3 ACTION SUBMITTALS

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

1.4 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.

1.5 COORDINATION

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

1.6 CONTINGENCY ALLOWANCE

- A. Use the contingency allowance only as directed by CMA for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
- B. Use of allowance will be authorized on a unit price, T&M or Lump Sum basis at the Owners sole option.
- C. Contractor's overhead and profit, on all work ordered by Owner under the contingency allowance are part of the Contract Sum and are not part of the allowance.
- D. Each Prime Contractor's proposed Schedule of Values submitted for approval shall list the designated contract allowance as separate line items.
- E. Each Prime Contractor shall proceed with all allowance work upon authorization from the Owner through CMA. When authorized on a unit price or T&M basis, the work shall be properly documented on a daily basis by Prime submissions of field tickets to the CMA for signature to verify the hours of work performed or other approved measure. Each ticket shall have a unique number listed that will be referenced during allowance reconciliation. The Owner, at their option, may reach an agreement with the Prime Contractor on a lump sum cost of the work, or a unit rate, at which the Prime Contractor shall perform the entire scope of work. The scope of the work is all inclusive and includes all labor, equipment, supervision, OSHA Safety compliance, materials and any other special conditions notated in the project documents.
- F. The Owner retains sole control over the allowance amount in the contract. Upon completion of the authorized work- with a positive balance remaining for the allowance the Owner shall apply a contract credit in the form of a Change Order to each Prime's contract for the full remaining amount. If, during the course of the work the allowance amount is used up, the Owner will issue a Change order to the Prime Contractor for the overage amount. All work that has been properly authorized by the Owner and exceeds the completed allowance amount shall fall under the terms and conditions of the Change Order compensation section of the Contract Documents for allowable charges and mark-up.

1.7 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. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
 2. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.

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: Existing Conditions (GC)
1. General Construction Prime Contractor shall include this allowance in the base bid.
 2. Amount: \$100,000 (One-Hundred Thousand Dollars and Zero Cents)
- B. Allowance No 2: Removal of Unsuitable/Contaminated Soils (GC)
1. General Construction Prime shall include this allowance in base bid.
 2. Amount: \$50,000 (Fifty Thousand Dollars and Zero Cents)

C. Allowance No 3: Tree Pruning & Arborist for trees over and above what is shown on the contract documents. (GC)

1. General Construction Prime shall include this allowance in base bid.

2. Amount: \$30,000 (Thirty Thousand Dollars and Zero Cents)

D. Allowance No. 4: Provide Temporary Signs as directed by the CMA. (GC)

1. General Construction Prime Contractor shall include this allowance in the base bid.

2. Amount: \$8,000 (Eight Thousand Dollars and Zero Cents)

E. Allowance No. 5: Existing Conditions (MC)

1. Mechanical Prime Contractor shall include this allowance in the base bid.

2. Amount: \$60,000 (Sixty Thousand Dollars and Zero Cents)

F. Allowance No. 6: Existing Conditions (EC)

1. Electrical Prime Contractor shall include this allowance amount in the base bid.

2. Amount: \$100,000 (One-Hundred Thousand Dollars and Zero Cents)

G. Allowance No 7: Provide and Install Twelve (12) additional Exit Signs. (EC)

1. Electrical Prime Contractor shall include this allowance in the base bid.

2. Amount: \$6,000 (Six Thousand Dollars and Zero Cents)

H. Allowance No. 8: Existing Conditions (PC)

1. Plumbing Prime Contractor shall include this allowance in the base bid.

2. Amount: \$75,000 (Seventy-Five Thousand Dollars and Zero Cents)

I. Allowance No. 9: Existing Conditions (FPC)

1. Fire Protection Prime Contractor shall include this allowance in the base bid.

2. Amount: \$60,000 (Sixty Thousand Dollars and Zero Cents)

END OF SECTION

SECTION 01 22 00 - UNIT PRICES**PART 1 – GENERAL****1.1 SUMMARY**

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

1.2 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.

1.3 DEFINITIONS

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

PART 2 – NOT USED**PART 3 – EXECUTION****3.1 SCHEDULE OF UNIT PRICES**

No.	Item	Unit Price Add	Unit Price Deduct
1.	Unit Cost: Fire Extinguisher with Cabinet (REF: 10 44 16 - Fire Extinguishers section 1.2)	/PC	/PC
2.	Unit Cost: Cost to furnish and install 2A Modified Stone. Assume 10 Tons.	UC	UC
3.	Unit Cost: Cost to furnish and install (10) added Terra Cotta TC30 Deep Red Panels	UC	UC
4.	Unit Cost: Cost to furnish and install (2) added Terra Cotta TC30 Oyster Panels	UC	UC

5.	Unit Cost: Cost to delete a single sprinkler head from design layout to NFPA 13 Required layout.	UC	UC
6.	Unit Cost: Cost to furnish and install (12) added sprinkler head from overhead pipe main to fixture.	UC	UC
7.	Unit Cost: Cost to furnish and install (12) Felt Ceiling Baffles	UC	UC
8.	Unit Cost: Cost to furnish and install (1) Electrical Power Outlet - Duplex	UC	UC
9.	Unit Cost: Cost to furnish and install (1) Data Outlet	UC	UC

END OF SECTION

SECTION 01 23 00 – ALTERNATES

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

- A. This Section identifies each Alternate by number and describes the basic changes to be incorporated into the Work, if that Alternate is made part of the Contract.

1.2 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

- A. Applicable provisions of Bidding Requirements, Contract Requirements and other Division 1 sections.

1.3 ADMINISTRATIVE PROCEDURES

- A. Referenced Sections of Specifications stipulate pertinent requirements for products and methods to achieve the Work stipulated under each Alternate.
- B. Coordinate pertinent related Work and modify surrounding Work as required to properly integrate the Work under each Alternate, and to provide the complete construction required by the Contract Documents.
- C. Immediately following the award of the Contract, prepare and distribute to each party involved, notification of the status of each Alternate. Indicate whether Alternates have been accepted, rejected or deferred for consideration at a later date.
- D. A "Schedule of Alternates" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate. 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.
- E. Award of Alternates will be made in any order.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION**3.1 SCHEDULE OF ALTERNATES****A. Alternate Add No. 1 – Domestic Water Booster Pump (Deleted)**

Reference: P1.0a

1. Plumbing Prime Contractor (PC): To not provide equipment:

Alt.1-PC: Add / Deduct (circle one) \$_____

2. Electrical Prime Contractor (EC): To not provide power:

Alt.1-EC: Add / Deduct (circle one) \$_____

B. Alternate Add No. 2 - Fire Pump (Deleted)

New 24" Water Main Pipe at Swede Street Potentially increasing water pressure. Please reference: P0.1, FP1.0a

1. Fire Protection Prime Contractor (FPP): Provide value for deleted fire pump & housekeeping pad:

Alt.3-FPP: Add / Deduct (circle one) \$_____

2. Electrical Prime Contractor (EC): Provide value for deleted fire pump wiring and power.

Alt.3-EC: Add / Deduct (circle one) \$_____

C. Alternate Add No. 3 – 2nd Floor Fireplace

Cost to provide the referenced Fireplace. Millwork opening will be included in the base bid.

Reference: M0.1, A9.2A

ANF: AQUAFIRE DESIGN, STYLE: PRESTIGE 60" WATER VAPOR FIREPLACE

(SKU: AWPR 60-150)

1. Electrical Prime Contractor (EC): Furnish & install electric fireplace.

Alt.4-EC: Add / Deduct (circle one) \$_____

2. Plumbing Prime Contractor (PC): Furnish & install water and drain connection to fireplace.

Alt.4-PC: Add / Deduct (circle one) \$_____

D. Alternate Add No. 4 – Exterior Typewriter Key Seating & Lighted Bollards

Furnish and install Twenty-two (22) typewriter key seats (similar to but different from the lobby typewriter seating) and Three (3) lighted bollards on the project west side of the building in lieu of Five (5) Streetlife Solid Crosswise and Curved Top Seat benches and Five (5) STP lights. Reference plans (including but not limited to): L2.1, L4.0, L7.1, A4.2, A9.10, E1.7. Note: Bollard anchors must be set in concrete.

1. General Prime Contractor (GC): Provide pricing alternate for typewriter key seats, and riverstone bed and edging.

Alt.5-GC: Add / Deduct (circle one) \$_____
 2. Electrical Prime Contractor (EC): Provide pricing alternate for lighted bollard lights in lieu of STP lights.

Alt.5-EC: Add / Deduct (circle one) \$_____
- E. Alternate Add No. 5 – Local History Collection Rm203 Ducted De-humidifier
Provide a packaged ducted de-humidifier to the Local History Collection room #203.
Reference: M0.1
1. Mechanical Prime Contractor (MC)

Alt.6-MC: Add / Deduct (circle one) \$_____
 2. Electrical Prime Contractor (EC)

Alt.6-EC: Add / Deduct (circle one) \$_____
- F. Alternate Add No. 6 – Provide Palmshield Ruga Railing, Architectural Bronze Finish at the west side per note A45 on Drawing A2.0 and A4.3. The product is in lieu of the specified railing.
1. General Prime Contractor (GC)

Alt.7-GC: Add / Deduct (circle one) \$_____

- G. Alternate Add No. 7 – Rigid Insulation at RTU Roof Curb. Provide 4" Rigid insulation around inside perimeter of roof curb in lieu of Hush core sound reduction system.
Reference: M2.2

1. Mechanical Prime Contractor (MC)

Alt.8-MC: Add / Deduct (circle one) \$_____

- H. Alternate Add No. 8 – Expandable Foam at Acoustical Duct Penetrations. Provide expandable foam at interior wall duct acoustic penetrations in lieu of fiberglass.
Reference: M2.1

1. Mechanical Prime Contractor (MC)

Alt.9-MC: Add / Deduct (circle one) \$_____

- I. Alternate Add No. 9 - Pavers in Lieu of Concrete (at Plan North- Powell Street)
Install pavers instead of concrete, from the sidewalk to the benches at the intersection of Powell Street and Scott Alley.

1. General Prime Contractor (GC)

Alt.10-GC: Add / Deduct (circle one) \$_____

- J. Alternate Add No. 10 – Elevator Overcurrent Protection Device & Machine Room/Shaft Heat Detection
Eliminate shunt trip enabled overcurrent protection device requirement for elevator power. Remove heat detection from Machine room and shaft. Coordinate all work with Fire Protection Prime Contractor.
Reference: E2.1

1. General Prime Contractor (GC)

Alt. 11-GC: Add / Deduct (circle one) \$_____

2. Electrical Prime Contractor (EC)

Alt.11-EC: Add / Deduct (circle one) \$_____

3. Fire Protection Prime Contractor (FPP)

Alt.11-FPP: Add / Deduct (circle one) \$_____

- K. Alternate Add No. 11 – Infill Sinkhole
Cost to over excavate and infill with clean stone, existing sinkhole in the parking lot as identified on drawing D 2436-02 02. Provide a backhoe with operator, truck with driver, foreman and laborer for 1 day to repair condition.

1. General Prime Contractor (GC)

Alt.12-GC: Add / Deduct (circle one) \$_____

- L. Alternate Add No. 12 – Mobile Video Guard Site Security
Provide Mobile Video Guard Site Security or Equal. 24-month duration, equipment mounting and dedicated power provided.

1. General Prime Contractor (GC)
Alt.13-GC: Add / Deduct (circle one) \$_____
2. Electrical Prime Contractor (EC)
Alt.13-EC: Add / Deduct (circle one) \$_____

END OF SECTION

SECTION 01 25 00 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Divisions 2 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and

- separate contractors, that will be necessary to accommodate proposed substitution.
- c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from IBC.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information. No substitution will be considered if there is not a cost benefit to the Owner.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY CONTROL

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTION REQUEST DURING CONSTRUCTION

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Requested substitution provides sustainable design characteristics that specified product provided.
 - c. Substitution request is fully documented and properly submitted.
 - d. Requested substitution will not adversely affect Contractor's construction schedule.
 - e. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - f. Requested substitution is compatible with other portions of the Work.
 - g. Requested substitution has been coordinated with other portions of the Work.
 - h. Requested substitution provides specified warranty.
 - i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 60 days after commencement of the Work. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation

services, increased cost of other construction by Owner, and similar considerations.

- b. Requested substitution does not require extensive revisions to the Contract Documents.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Requested substitution provides sustainable design characteristics that specified product provided.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified warranty.
- k. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

END OF SECTION 01 25 00

SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES**PART 1 - GENERAL****1.1 SUMMARY**

- A. General: This section specifies administrative and procedural requirements for modifications to the Work of the Contract.

1.2 DEFINITIONS

- A. Bulletin
 - 1. A Bulletin is a proposed modification to the Contract Documents prepared and issued by the Architect that accomplishes one or all of the following:
 - a. Clarifies or changes the Work.
 - b. Furnishes information which is supplemental to the Contract which may or may not change the Contract Sum or Contract Time as specified in the Bulletin.
 - 2. A bulletin is not an order to proceed.
 - 3. No bulletin shall be issued to the Contractor by the Architect until such bulletin has been reviewed and approved for release by the Owner.
- B. Modification: Refer to General Conditions, for definition of a Modification.
- C. Change Order: Refer to General Conditions, for definition of a Change Order.
- D. Construction Change Directive: Refer to General Conditions, for definition of a Construction Change Directive.

1.3 BULLETINS

- A. Issuance of Bulletins: With the approval of the Owner, the Architect may issue Bulletins as defined above.
 - 1. Bulletins issued by the Architect are for information only. Bulletins are not to be considered as an instruction either to stop work in progress, or to execute the proposed change.
 - 2. Unless otherwise indicated in the Bulletin, within 10 working days of receipt of the Bulletin, the Contractor shall submit to the Architect for their review of a detailed Change Order request of cost necessary to execute any proposed change as described in the bulletin.
 - a. Include a list of quantities of products to be purchased and unit costs, along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, amounts of trade discounts, labor costs, re-stocking charges, legitimate markups and other costs associated with the proposed change.

- c. Identify any changes to Work already executed which, if not addressed in the Bulletin, will require revision as part of the proposed change.
3. Include a statement in the Change Order Request indicating the effect the proposed change in the Work will have on the Contract Time.
4. The Owner will review and respond to the Contractor's proposal within ten (10) working days after its receipt.

1.4 **CHANGE ORDER PROCEDURES**

- A. Owner-Initiated Change Order Requests: A detailed description of proposed changes in the Work will be issued that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 1. Proposal Requests issued are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
 2. Within 10 working days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 3. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 4. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 5. Include an updated Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
- B. Contractor-Initiated Change Order Request: Should the Contractor discover a discrepancy, latent or other unforeseen conditions requiring modifications to the Contract Documents that was not previously noted, or determines upon receipt of clarification from the Architect that the work described may necessitate a Change Order, the Contractor shall promptly notify the Architect and Owner, of the intention to submit a Change Order request related to the item of Work.
- C. Within ten (10) working days of such notice, the Contractor shall submit a Change Order request to the Owner and Architect; Change Order Proposal Requests shall include the following:
 1. A statement outlining the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and Contract Time.
 2. A list of quantities of products to be purchased and unit costs along with the total amount of purchases to be made. Where requested, furnish survey data to substantiate quantities.
 3. An indication of applicable taxes, delivery charges, equipment rental, and amounts of trade discounts, labor costs, re-stocking charges, legitimate markups and other costs associated with the proposed change.

4. Coordination information, including a list of changes or modifications made necessary to other parts of the Work and to construction performed by separate contractors that will become necessary to accommodate the proposed change or modification.
 5. Comply with requirements in Section 01 60 00 "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified
 6. Failure by the Contractor to include the above requirements in the change order request may cause rejection of the request in its entirety.
- D. Approval of Change Order: Upon the Owner's approval of a Change Order Request or bulletin, the CM will generate, sign, issue and forward the Change Order for the signature of the Owner as provided in the Conditions of the Contract.
- E. Commencement of Proposed Changes: Work on proposed changes that affect the Contract Sum and/or the Contract Time shall not be started until an approved signed Change Order has been received by the Contractor, unless otherwise directed by the Owner in writing.
- F. Record of Changes: In all cases, the Contractor shall maintain an accurate account of labor and materials involved in the change.

1.5 CONSTRUCTION CHANGE DIRECTIVE

- A. Purpose: When the Owner and Contractor are not in total agreement on the terms of a Change Order Proposal Request, the Owner may direct the CM to issue a Construction Change Directive, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
- B. Description of Changes: The Construction Change Directive will contain a complete description of the change in the Work and designate the method to be followed to determine change in the Contract Sum or Contract Time.
- C. Records: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
- D. Submittal of Data: After completion of the change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

1.6 COORDINATION

- A. Revision of Schedule of Values and Application for Payment: Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item.
- B. Revision to Progress Schedule: Promptly revise Progress Schedule to reflect any change in Contract Time; revise schedules to adjust times for other items of work affected by the change and resubmit.

1.7 DISPUTES

- A. Notification of Disagreement: Should the Contractor and Owner disagree about the value of the proposed change in the Contract Sum or Contract Time, the Contractor shall notify the Owner, in writing, stating the reason for the disagreement. Disagreement about the value of a Change Order does not relieve the Contractor of responsibility to proceed with the change as ordered and to seek settlement of the dispute under the pertinent provisions of the Contract Documents and in accordance with the provisions as specified

herein.

PART 2 - PRODUCTS
(NOT APPLICABLE)

PART 3 - EXECUTION
(NOT APPLICABLE)

END OF SECTION

SECTION 01 29 00 - PAYMENT PROCEDURES**PART 1 - GENERAL****1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
 - 2. Section 01 22 00 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 3. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 4. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.
 - 5. Section 01 81 13 "Sustainable Design Requirements"

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule. Cost-loaded Critical Path Method Schedule may serve to satisfy requirements for the schedule of values.
 - 1. Coordinate line items in the schedule of values with items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to the Construction Manager for review and comment at earliest possible date, but no later than 20 days from NTP submittal of initial Applications for Payment. CM will coordinate review with Architect.

3. Sub-schedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide sub-schedules showing values coordinated with each phase of payment.
 4. Sub-schedules for Separate Elements of Work: Where the Contractor's construction schedule defines separate elements of the Work, provide sub-schedules showing values coordinated with each element.
 5. Sub-schedules for Separate Design Contracts: Where the Owner has retained design professionals under separate contracts who will each provide certification of payment requests, provide sub-schedules showing values coordinated with the scope of each design services contract, as described in Section 01 10 00 "Summary."
- B. Format and Content: Use 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. Owner's name.
 - c. Owner's Project number.
 - d. Name of Architect.
 - e. Architect's Project number.
 - f. Contractor's name and address.
 - g. Date of submittal.
 2. Arrange schedule of values consistent with format of AIA Document G703 Application and Certificate for Payment.
 3. Arrange schedule of values to include the following General Conditions / General Requirements breakdowns:
 - a. General Conditions
 - i. Supervision
 1. Project Manager(s)
 2. Field Supervision
 3. Project Engineer/Administration
 4. Safety
 - ii. Bonds
 - iii. Taxes & Insurance
 - iv. Permitting
 - v. Clean Up
 1. Throughout project - Labor
 2. Final cleaning
 - vi. Schedule Management
 1. Baseline development
 2. Monthly Update process
 3. Submittal Schedule / Log
 - vii. Coordination
 1. Below Grade and Above Ceiling
 2. BIM Coordination (Refer to 01 requirements)
 - viii. Temporary Facilities & Controls
 1. Temporary utilities and usage charges

2. Temporary conditioning
 3. Temporary lighting
 4. Fencing & Barricades
 5. Street & Sidewalk closures including signage
 6. Temporary bathroom & handwashing facilities
 7. Other items as required or defined in the specifications.
 - ix. QA/QC
 1. Commissioning (As Applicable, this can be included in trade line items)
 2. Testing/Inspection Requirements
 - a. 3rd Party and Manufacturer req'd inspections
 - x. Asset management Requirements
 - xi. Close Out
 1. As-Builts including BIM Model Updates
 2. Punchlist
 3. Closeout Documentation
4. 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 of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent. Round dollar amounts to whole dollars, with total equal to Contract Sum.
 - 1) Labor.
 - 2) Materials.
 - 3) Equipment.
4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide multiple line items for principal subcontract amounts in excess of five percent of 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.
6. 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.

7. Purchase Contracts: Provide a separate line item in the schedule of values for each Purchase contract. Show line-item value of Purchase contract. Indicate Owner payments or deposits, if any, and balance to be paid by Contractor.
8. Overhead Costs, Proportional Distribution: Include total cost and proportionate share of general overhead and profit for each line item.
9. Overhead Costs, Separate Line Items: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
10. Temporary Facilities: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
11. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling **five** percent of the Contract Sum and subcontract amount. This is inclusive of but not limited to the items noted above. The closeout cost SOV line item will not be invoiced until all required documentation is submitted and approved. The CMa, A/E and Owner shall have sole discretion.
12. Schedule of Values Revisions: Revise the schedule of values when Change Orders or Construction Change Directives result in a change in the Contract Sum. Include at least one separate line item for each Change Order and Construction Change Directive.

1.5 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments, as certified by the Construction Manager and paid for by Owner.
 1. Process shall follow as noted below:
 - a. All pay application processes will be submitted through E-Builder.
 - b. Pencil copy submitted to CM and A/E for review
 - c. Comments returned by CM/A/E within 7 days
 - d. Prime contractors revise application and resubmits final notarized copy with back-up documents (certified payroll, local/dbe participation forms, lien waiver, steel certificates & stored material back-up, statement of accounts, and other required documents)
 - e. CM and A/E review & certify invoice
 - f. CM transmits to Montgomery County for processing
- B. Payment Application Times: The date for each progress payment is indicated in the Owner/Contractor Agreement. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Times: Submit Draft Application for Payment to CM by the 25th of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.
- D. Application for Payment Forms: Use AIA Document G732 'Application and Certificate for Payment, Construction Manager as Adviser Edition' and AIA Document G703 'Continuation Sheet' as forms for Applications for Payment.

- E. 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 for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
 3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.
- F. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.
1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment for stored materials.
 2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
 3. Provide summary documentation for stored materials indicating the following:
 - a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
 - b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
 - c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.
- G. Transmittal: Electronic copies, signed and notarized, of each Application for Payment to Construction Manager. Include waivers of lien and similar attachments if required.
- H. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

4. Submit final Application for Payment with or preceded by conditional 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 executed waivers of lien on forms acceptable to Owner.
- I. Progress Payment Additional Documentation
1. Submit Local and Diverse Business Goal participation forms with each application. Submissions shall follow the guidelines defined in Exhibit A. Montgomery County will provide all necessary forms for the contractors to complete.
 2. Electronic copies of daily reports for invoice month
 3. Certified Payroll Reports (Must be submitted twice per month)
- J. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors, suppliers & equipment vendors.
 2. Fully executed subcontracts including suppliers and equipment vendors
 3. Schedule of values.
 4. Contractor's Start Up construction schedule.
 5. Key personnel list
 6. Submittal Register & schedule
 7. Combined Contractor's Baseline construction schedule (preliminary if not final), incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
 8. Products list (preliminary if not final).
 9. Asset Management Information Strategy
 10. Sustainable design action plans, including preliminary project materials cost data.
 11. List of Contractor's staff assignments.
 12. List of Contractor's principal consultants.
 13. Copies of building permits.
 14. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 15. Initial progress report.
 16. Report of preconstruction conference.
 17. Community Participation Plan per Exhibit A
 18. Labor Rate Breakdown sheets for all contracts & subcontracts
- K. Certificates of insurance and insurance policies.
1. Performance and payment bonds.
 2. Data needed to acquire Owner's insurance.
- L. Application for Payment at Substantial Completion: After Architect issues 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.

- a. Complete administrative actions, submittals, and Work preceding this application, as described in Section 01 70 00 "Execution and Closeout Procedures."
 2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- M. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Certification of completion of final punch list items.
 3. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 4. Updated final statement, accounting for final changes to the Contract Sum.
 5. AIA Document G706.
 6. AIA Document G706A.
 7. AIA Document G707.
 8. Evidence that claims have been settled.
 9. 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.
 10. Final liquidated damages settlement statement.
 11. Proof that taxes, fees, and similar obligations are paid.
 12. Waivers and releases.

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. General: This Section specifies administrative and procedural requirements for Project Management and Coordination by the CM, including but not limited to:
 - 1. General coordination procedures.
 - 2. Coordination drawings.
 - 3. Lean Procedures
 - 4. Requests for Information (RFIs).
 - 5. Project Web site.
 - 6. Project meetings
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Within twenty (20) days of Notice to Proceed, prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Subcontract list shall be updated weekly by prime contractor and submitted to CM. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Within fifteen (15) days of Notice to Proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site or elsewhere. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. Keep list current at all times.

1.3 PROJECT MEETINGS

- A. General: CM to schedule and administer project meetings throughout the progress of the Work. Prepare agenda, conduct meetings, record meeting results, and distribute recorded

proceedings and decisions to participants and other affected parties.

B. Regularly Scheduled Project Meetings

1. Notification: For meetings not regularly scheduled, give participants not less than three (3) days prior notice.
2. Attendees: The Owner, CM, Architect and their consultants, all Prime Contractors, their Project Executives, Project Managers and their Superintendents, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project. Discuss items of significance that could affect progress including review of the present and future needs of each entity present and such topics as:
 - a. Lean procedures
 - b. Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Construction Schedule, whether on time or ahead or behind 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.
 - c. Critical Work sequencing and interface requirements.
 - d. Quality and Work standards.
 - e. Designation of responsible personnel.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of Contract Documents.
 - i. Submittal of Shop Drawings, Product Data and Samples.
 - j. Preparation of record documents.
 - k. Site utilization, use of the premises and access.
 - l. Office, Work and storage areas.
 - m. Equipment deliveries and priorities.
 - n. Non-compliance issues.
 - o. Bulletins and Change Orders.
 - p. Architect's Supplemental Instructions (ASI's) and Requests for information (RFI's).
 - q. Documentation of information for payment requests.
 - r. Off-site fabrication problems
 - s. Security.
 - t. Housekeeping.
 - u. Working hours.
 - v. Prior to the execution of the Work, and in addition to pre-construction or pre-installation meetings specified in technical specification sections, schedule a pre-construction conference with each sub-contractor to review product selection, the procedures for executing the Work and the coordination required with other trades.
 - w. Insurance COI Updates.
 - x. Applications for Payment and pencil copies.
 - y. Certified Payroll.
 - z. Waivers and Releases.
 - aa. O&M Manuals, Warranties.
 - bb. Start-ups and Commissioning.

- cc. Safety.
- dd. Housekeeping.

4. Reporting: No later than 5 days after each meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

C. Coordination Meetings

1. Conduct Project coordination meetings at regularly scheduled times convenient for parties involved. Project coordination meetings are in addition to specific meetings held for other purposes, such as regular progress meetings and special pre-installation or pre-construction meetings.
2. Request representation at each meeting by every party currently involved in coordination or planning for the construction activities involved.
3. Record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

D. Pre-Construction Conference

1. CM will schedule and conduct a preconstruction conference before starting construction and prior to the installation of building components, at a time convenient to Contractor, Owner and Architect, but no later than ten (10) days after execution of the Agreement or prior to commencement of work.
2. Schedule a pre-construction conference and organizational meeting, prior to commencement of each category of the Work to review the material selections, fabrication and installation procedures, and coordination among the various trades. The categories of Work shall generally correspond with the Sections of the Specifications. CM, Installer, manufacturers' representatives, and any trade that requires coordination with the Work, shall meet at the project site or other location as mutually agreed. Conduct the meeting to review responsibilities and personnel assignments. CM to record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

E. Lean Training and Pull Planning Meeting: CM will schedule and conduct a Lean Training and Pull Planning Meeting after submission of the Startup Construction Schedule, but no later than Twenty (20) days after execution of the Agreement.

1. CM to conduct the conference to train and familiarize all required project personnel, inclusive of each prime contractor and key subcontractors, with Lean procedures and then, as the foundation of the Lean process, develop a Pull Plan for a phase of the project based on the project knowledge of each participant having developed their individual start-up schedules.
2. Allow a minimum of 12 hours over 2 days for all required personnel.
3. Attendees: Owner, CM, Architect, and their consultants, contractor and its superintendent, major subcontractors, major 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.

F. Last Planner Meetings: CM will facilitate Last Planner Meetings on a weekly basis. The

purpose of the meetings is to plan and coordinate the near-term work to allow coordination between prime contractors and their subcontractors.

1. CM to conduct the conference to develop and improve workflow on the project site based on commitments made and evaluation of results.
 2. Allow a minimum of 1.5 hours per week for required attendees.
 3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
 4. Topics may include the following:
 - a. Interface requirements.
 - b. Sequence of operations.
 - c. Status of submittals.
 - d. Deliveries.
 - e. Off-site fabrication.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and controls.
 - i. Work hours.
 - j. Hazards and risks.
 - k. Progress cleaning.
 - l. Quality and work standards.
 - m. Change Orders.
 5. Minutes: CM will record and distribute meeting minutes.
- G. Lean Daily Huddles: CM will conduct Lean Daily Huddles.
1. CM to facilitate the huddle to review work plans, evaluate performance against commitments and make adjustments to daily planned activities.
 2. Allow a minimum of 30 minutes per day for required attendees.
 3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major 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.
- H. Special Meetings
1. Special meetings may be called as required, at a place and time as coordinated by the CM.
- I. Project Closeout Conference
1. The CM will schedule and conduct a Project closeout conference, at a time convenient to Owner and Architect, but no later than 90 calendar days prior to the scheduled date of Substantial Completion.

1.4 GENERAL COORDINATION PROCEDURES

- A. General: Coordinate construction activities included under various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections of the Specifications that are dependent upon each other for proper installation, fit, connection, and operation.
 - 1. Sequence of Construction Activities Schedule: Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule construction activities in the sequence required to obtain coordinated results.
- B. Accessibility in Limited Space: Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- C. Provisions for Later Installation: Make adequate provisions to accommodate items scheduled for later installation.
- D. 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 Construction Manager and separate contractors if coordination of their Work is required.
- E. 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. Pre-installation conferences.
 - 7. Project closeout activities.
 - 8. Startup and adjustment of systems.
- F. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1.5 COORDINATION DRAWINGS

- A. General (All Primes): The Contractors shall produce and submit project specific information for coordination purposes, a set of color-coded "Coordination Drawings" to confirm that the work of subcontractors is coordinated.
 - 1. Each prime shall provide 3-D REVIT coordination of their work with those of the other

M/P/FP/E contractors as well as the concrete foundation, structural and architectural packages. As part of this effort each prime contractor and key subcontractors shall attend all coordination meetings & provide work plans on a weekly basis coordinated with the CM.

2. Mechanical Prime Contractor (MC) will lead the coordination process. The MC will provide a cloud-based model hosting site for use by the project team during the coordination process. The point cloud shall be converted to a REVIT LOD 300 standard model for use by all primes.
3. Drawings shall be drawn accurately to scale to show the interrelationship of components shown on separate shop drawings and shall indicate mechanical, plumbing, electrical, structural, fire protection, cable trays and contiguous architectural Work in sufficient detail so as to verify that contractors will accomplish their respective Work without conflicting with other contiguous trades. Refer to technical specifications for additional information.
4. The GC Prime Contractor is responsible for providing a centerline Tekla model detailing structural members, connections, and all other structural components. The GC Prime Contractor will provide this complete model to the Mechanical/HVAC Contractor to use for coordination. The Mechanical/HVAC will lead the coordination process, after receipt of the Tekla model, and develop the base floor plan drawings to be utilized by all prime contractors to prepare and model their respective work. Upon completion and sign-off by all Contractors, the Mechanical/HVAC Contractor shall submit final coordination drawings to Architect/Engineer for review and acceptance.
5. The Mechanical/HVAC prime shall provide means to host the coordination model for use by all other prime contractors throughout the entire duration of the project.
6. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
7. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
8. Indicate required installation sequences.
9. 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.
10. The following is a list of such Work requiring coordination drawings:
 - a. Ceiling assemblies and cavities.
 - b. Fire rated and acoustical partitions.
 - c. MEPFP, A/V, Low Voltage, Security Systems
 - d. Structural Systems

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. Supplement plan drawings with section drawings where required to adequately

represent the Work.

2. Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within plenums to accommodate layout of light fixtures and other components indicated on Drawings. Indicate areas of conflict between light fixtures and other components.
3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Roof and Wall Penetrations: Indicate all penetrations required for all disciplines.
7. Mechanical and Plumbing Work: Show the following:
 - a. Sizes and bottom elevations of ductwork, piping, and conduit runs, including insulation, bracing, flanges, and support systems.
 - b. Dimensions of major components, such as equipment, dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - c. Fire-rated enclosures around ductwork.
8. Electrical, A/V & Low Voltage Work: Show the following:
 - a. Runs of vertical and horizontal conduit 1-1/4 in. in diameter and larger.
 - b. Light fixture, exit light, emergency battery pack, smoke detector, and other fire-alarm locations.
 - c. Panel board, switch board, switchgear, transformer, busway, generator, and motor-control center locations.
 - d. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - e. Main distribution for low-voltage conduit.
 - f. A/V and Low voltage equipment and components
9. Fire-Protection System: Show the following:
 - a. Locations of standpipes, mains piping, branch lines, pipe drops, fire pump and related components and sprinkler heads.
10. Security Systems
 - a. Runs of vertical and horizontal conduit 1-1/4 in. in diameter and larger.
 - b. Panels boards, cabinets and equipment
11. Review: Architect will review coordination drawings to confirm that in general the Work is being coordinated, but not for the details of the coordination, which are Contractors' responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform the CM, who will direct the Contractors make suitable modifications and resubmit.

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

requirements:

1. File Preparation Format: Same digital data software program, version, and operating system as original Drawings.
 2. File Submittal Format: Submit or post coordination drawing files using format same as file preparation format or PDF format as agreed upon.
 3. Architect and/or consultants will furnish Contractors one set of digital data files of BIM model for use in preparing coordination digital data files.
 - a. Architect and/or consultants make no representations as to the accuracy or completeness of digital data files as they relate to Drawings. Prime contractors are solely responsible to modify, confirm dimensions in the field and incorporate changes as required to develop a fully coordinated model.
 - b. Digital Data Software Program: Drawings are available in REVIT
 - c. Contractor shall execute a data licensing agreement in the form of Agreement included in this Project Manual or provided by A/E.
 4. Modification of Original Coordination Digital Files: At completion of the Work, original coordination digital files shall be modified by Contractors to indicate as-built conditions and transmitted to the Owner.
- D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1.6 ARCHITECT'S SUPPLEMENTAL INSTRUCTIONS

- A. Architect's Supplemental Instructions (ASI): An Architect's Supplemental Instruction is an instruction issued by the Architect to make minor changes in the Work that are consistent with the Contract Documents, fall within the Contract Sum and do not involve an extension of Contract Time. This document describes the change and references any attached documents supporting the description.

1.7 PROJECT WEB SITE

- A. Use the Owners or CM'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 logs.
 6. Schedule.
 7. Submittal schedule.
 8. Submittals logs.

9. Drawing and specification document hosting and viewing.
- B. Managing the Project Management Information System (PMIS)
1. This project will utilize eBuilder for all facets of the project including but not limited to communication, document control management and invoicing. Each prime will be provided up to 5 access log-ins.
 2. Access to the PMIS system shall be granted the entire length of the project and for 3 months after the final completion date.
 3. All prime contractors will submit RFI's and submittals through E-Builder for processing to CMA and Architect. As part of the training and pre construction conference, PMIS system work flow will be established.
 4. Prime Contractors are required to submit updated submittal registers on a weekly basis until all submittals have been issued. This shall be uploaded to E-Builder and sent to the A/E and CMA for coordination.
- C. Project Quality Records and Documentation (In Addition to PMIS)
1. Use of ProCore Software.
 - a. Contractor acknowledges use of Procore CM software for tracking items related to QA/QC, access to which will be provided by the CMA.
 - b. Access to Procore project shall be granted the entire length of the project and for 3 months after the final completion date.
 2. Test and Inspection Log: Contractor to record a log of all tests and inspections utilizing Procore Inspections. Recording of tests and inspections includes the following:
 - a. Date test or inspection was conducted.
 - b. Description of the Work tested or inspected.
 - c. Date test or inspection results were transmitted to Architect.
 - d. Identification of testing agency or special inspector conducting test or inspection.
 - e. Result of inspection. Includes description of remedial work to complete in case of a failure.
 - f. A copy of the testing agency/inspector's report.
 3. Punch List and Observations: Contractor acknowledges that use of Procore software includes not only entry of observations, punch list, tests, and inspections on the part of the Contractor, but also review and generation of responses to entries created by the CMA or AE in a timely manner.
 - a. Observations will include items related to:
 - 1) Commissioning.
 - 2) Environmental.
 - 3) Quality.
 - 4) Safety.
 - 5) Warranty.
 - 6) Work to complete.
 - b. The AE design team will input non-conformance items, punch list, and other related observations utilizing Procore in conjunction with the CMA. Contractor acknowledges review and response to AE provided items must be done in Procore by the due date specific to each item. Responses to punch list must include comment and/or photos related to the punch list item detailing date of completion, work completed, and any related documentation prior to review by the CMA/AE team.
 4. Commissioning: Cx Agent to utilize Procore to provide an issues log/action items to be provided to the responsible parties. Cx Agent will use the Commissioning Observation

type to specify the issue, contributing conditions, contributing behavior, specific location if applicable, trade, assignees, and suggested actions.

D. Project PMIS and Training

1. The Owner will provide training on the usage and functionality of E-Builder. CMa will coordinate and schedule (2) training sessions within fifteen (15) business days of the Notice to Proceed. All primes are required to attend one or both sessions.

E. PMIS Closeout

1. Project PMIS will remain open for a period of three (3) months after Final Completion to allow all parties access to necessary information. The Owner has discretion to deny access to users at any time.

F. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement.

1.8 REQUESTS FOR INFORMATION

A. Definition: During the bidding process or progress of the Work, the Contractor may uncover situations for which they believe the Contract Documents are not clear in their requirements whereupon they may submit a Request for Information (RFI) to the CM. The CM will then forward to the Architect with recommendations.

B. Correspondence: Contractor correspondence related to the Work shall be addressed to the Architect.

C. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit to the Construction Manager an RFI in the form specified.

1. Construction Manager 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.

D. Conditions for Requests for Information: If, after issuance of the "Notice to Proceed" clarification from the Architect concerning questions which may have arisen during the course of the Work, the Contractors may initiate a process of standard form letters identified as "Request(s) for Information" (RFI) subject to the following conditions:

E. RFI Forms: Software generated form with substantially the same content noted below, and acceptable to the Architect and CM. RFI's and attachments shall be submitted in PDF format.

1. RFIs shall contain specific reference to the project name, project number, name of Contractor, Architect, and the CM, drawing number and detail references, specification section and paragraph number, schedule type, or other related document which is pertinent to the Contractor's inquiry. The date of referenced documents or drawings must be clearly identified.
2. RFIs for the Architect shall be numbered sequentially and are not to be skipped, with the date of issue clearly noted. RFI's shall be submitted in an agreed upon electronic digital format and shall be forwarded to the Architect.

3. RFIs shall include all field dimensions, sketches, descriptions, measurements, photos, product data or other information necessary to fully describe items needing interpretation. Contractor is to provide a suggested solution. If the suggested solution may impact the Contract Time, Contract Sum, or schedule, the Contractor must state the impact.
 4. RFIs shall originate only from the Contractor's on-site staff and shall be signed by the Contractor. RFI's submitted to the Architect by individuals other than the CM will not be accepted.
 5. Architect and CM will respond to and return RFI's to Contractor within 10 business days.
 6. On receipt of Architect's and CM's action, update RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and CM within seven (7) days if Contractor disagrees with response.
 - a. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request as appropriate.
 - b. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
 7. RFI logs shall reflect the date on which an RFI has been responded to in addition to when they have been fully resolved. If an RFI is delayed due to additional testing or information, this delay shall be noted and the response will read as such until the new information becomes available in which case a revision to that original RFI will be issued.
 8. It shall be the responsibility of the Contractor to maintain an up-to-date electronic log of RFI's and to advise the CM, in writing of the status and disposition of RFI's at the weekly progress meetings.
- F. RFI logs: Prepare, maintain, and submit tabular log of RFIs organized by the RFI number. Contractor's RFI logs should be provided one day prior to weekly meeting to intercept and mark up incorrect or misleading information.
1. RFI logs shall include the following information: Project name, name and address of contractor, name and address of CM and Architect, RFI number, including RFIs that were returned without action or withdrawn, RFI description, date RFI was submitted, and date Architect's and CM's response was received.
 2. RFI logs shall reflect the date on which an RFI has been responded to in addition to when they have been fully resolved. If an RFI is delayed due to additional testing or information, this delay shall be noted and the response will read as such until the new information becomes available in which case a revision to that original RFI will be issued.
 3. RFIs shall not be utilized by the Contractors to request approval of submittals or to solicit consideration by the Architect of a "substitution".
 4. RFIs shall not be utilized by the Contractors to request any extension of Contract time or to request any revision of Contract cost. If the Contractors believes that the response received from the Architect to any RFI warrants adjustment of the Contract time or cost, he shall advise the CM in writing immediately upon receipt of the response.

5. RFIs shall not be utilized by the Contractors to request coordination information already indicated in the Contract Documents or to solicit clarification of comments that have been communicated to the Contractor by the Architect in the course of shop drawing review or the review of other required submittals.
6. The Owner reserves the right to assess the Contractors for the cost (based on time and materials) of the review process performed by the Architect and/or any of the Architect's or Owner consultants when RFI's fail to conform to the requirements stated herein, or in the opinion of the Architect, are unnecessary or frivolous (i.e.; the subject of the inquiry noted in the RFI is suitably and/or clearly addressed in the Contract Documents).
7. The Contractors shall submit RFI's sufficiently in advance of the Work to be performed as it relates to the Construction Schedule such that the Architect has ample time to review and respond to RFI's. The Architect will respond to RFI's sequentially in the order they are received.
8. Any written or electronic procedure selected by the Contractors to solicit responses to questions which arise during the course of the Work shall be required to comply with the procedures stated in paragraphs above.
9. RFIs not to be used for:
 - a. Resolving Contractor error.
 - b. Assisting in the development of a shop drawing.
 - c. Confirming a conversation, correspondence, discussion, or decision.
 - d. Requesting information not pertaining to the contracted scope of work.
 - e. Seeking direction for client directed work or changes unrelated to deficiencies in the contract documents.
 - f. Seeking direction for contractor materials and methods procedures.

1.9 PROJECT MEETINGS

- A. General: CM or required entity shall schedule and conduct the project meetings throughout the progress of the Work unless otherwise noted. The responsible entity will prepare agenda, conduct meetings, record meeting results, and distribute recorded proceedings and decisions to participants and other affected parties.
 1. Each prime contractor project manager, superintendent and other project team members are required to attend meetings. Attendance is mandatory. Contractors who miss required meetings will be back charged at the sole discretion of the Owner and CM.
- B. Regularly Scheduled Project Meetings
 1. Notification: For meetings not regularly scheduled, give participants not less than three (3) days prior notice.
 2. Attendees: The Owner, CM, Architect and their consultants, all Prime Contractors, their Project Executives, Project Managers and their Superintendents, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the Work.
 3. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the Project. Discuss items of

significance that could affect progress including review of the present and future needs of each entity present and such topics as:

- a. Lean procedures
 - b. Construction Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Construction Schedule, whether on time or ahead or behind 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.
 - c. Critical Work sequencing and interface requirements.
 - d. Quality and Work standards.
 - e. Designation of responsible personnel.
 - f. Procedures for processing field decisions and Change Orders.
 - g. Procedures for processing Applications for Payment.
 - h. Distribution of Contract Documents.
 - i. Submittal of Shop Drawings, Product Data and Samples.
 - j. Preparation of record documents.
 - k. Site utilization, use of the premises and access.
 - l. Office, Work and storage areas.
 - m. Equipment deliveries and priorities.
 - n. Non-compliance issues.
 - o. Bulletins and Change Orders.
 - p. Architect's Supplemental Instructions (ASI's) and Requests for information (RFI's).
 - q. Documentation of information for payment requests.
 - r. Off-site fabrication problems
 - s. Security.
 - t. Housekeeping.
 - u. Working hours.
 - v. Prior to the execution of the Work, and in addition to pre-construction or pre-installation meetings specified in technical specification sections, schedule a pre-construction conference with each sub-contractor to review product selection, the procedures for executing the Work and the coordination required with other trades.
 - w. Insurance COI Updates.
 - x. Applications for Payment and pencil copies.
 - y. Certified Payroll.
 - z. Waivers and Releases.
 - aa. O&M Manuals, Warranties.
 - bb. Start-ups and Commissioning.
 - cc. Safety.
 - dd. Housekeeping.
4. Reporting: No later than 5 days after each meeting date, distribute copies of minutes of the meeting to each party present and to other parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

C. Pre-Construction Conference

- 1. CM will schedule and conduct a preconstruction conference before starting construction and prior to the installation of building components, at a time convenient to Contractor, Owner and Architect, but no later than ten (10) days after execution of the Agreement or prior to commencement of work.
- 2. Schedule a pre-construction conference and organizational meeting, prior to

commencement of each category of the Work to review the material selections, fabrication and installation procedures, and coordination among the various trades. The categories of Work shall generally correspond with the Sections of the Specifications. CM, Installer, manufacturers' representatives, and any trade that requires coordination with the Work, shall meet at the project site or other location as mutually agreed. Conduct the meeting to review responsibilities and personnel assignments. CM to record meeting results and distribute copies within 3 days to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

3. Agenda: Discuss items of significance that could affect progress, including the following:

- a. LEAN Procedures
- b. Tentative construction schedule.
- c. Phasing.
- d. Critical work sequencing and long-lead items.
- e. Designation of key personnel and their duties.
- f. Lines of communications.
- g. Procedures for processing field decisions and Change Orders.
- h. Procedures for RFIs.
- i. Procedures for testing and inspecting.
- j. Procedures for processing Applications for Payment.
- k. Distribution of the Contract Documents.
- l. Submittal procedures.
- m. Preparation of record documents.
- n. Use of the premises and existing building.
- o. Work restrictions.
- p. Working hours.
- q. Owner's occupancy requirements.
- r. Responsibility for temporary facilities and controls.
- s. Procedures for moisture and mold control.
- t. Procedures for disruptions and shutdowns.
- u. Construction waste management and recycling.
- v. Parking availability.
- w. Office, work, and storage areas.
- x. Equipment deliveries and priorities.
- y. First aid.
- z. Security.
- aa. Progress cleaning.

D. Lean Training and Pull Planning Meeting: CM will schedule and conduct a Lean Training and Pull Planning Meeting after submission of the Startup Construction Schedule, but no later than Twenty (20) days after execution of the Agreement.

- 1. CM to conduct the conference to train and familiarize all required project personnel, inclusive of each prime contractor and key subcontractors, with Lean procedures and then, as the foundation of the Lean process, develop a Pull Plan for a phase of the project based on the project knowledge of each participant having developed their individual start-up schedules.
- 2. Allow a minimum of 12 hours over 2 days for all required personnel.
- 3. Attendees: Owner, CM, Architect, and their consultants, contractor and its superintendent, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.

- E. Last Planner Meetings: CM will facilitate Last Planner Meetings on a weekly basis. The purpose of the meetings is to plan and coordinate the near-term work to allow coordination between prime contractors and their subcontractors.
1. CM to conduct the conference to develop and improve workflow on the project site based on commitments made and evaluation of results.
 2. Allow a minimum of 1.5 hours per week for required attendees.
 3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major 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.
 4. Topics may include the following:
 - a. Interface requirements.
 - b. Sequence of operations.
 - c. Status of submittals.
 - d. Deliveries.
 - e. Off-site fabrication.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and controls.
 - i. Work hours.
 - j. Hazards and risks.
 - k. Progress cleaning.
 - l. Quality and work standards.
 - m. Change Orders.
 5. Minutes: CM will record and distribute meeting minutes.
- F. Lean Daily Huddles: CM will conduct Lean Daily Huddles.
1. CM to facilitate the huddle to review work plans, evaluate performance against commitments and make adjustments to daily planned activities.
 2. Allow a minimum of 30 minutes per day for required attendees.
 3. Required Attendees: CM, area foremen for each of the prime contractors, major subcontractors, major suppliers, and other concerned parties shall attend the conference. Participants at the conference shall be familiar with the Project and authorized to conclude matters relating to the Work.
 4. Minutes: CM will record and distribute meeting minutes as required.
- G. Special Meetings
1. Special meetings may be called as required, at a place and time as coordinated by the CM.
- H. Pre-installation Conferences: Conduct a pre-installation conference at the Project site before each construction activity that requires coordination with other construction. Pre-installation conferences shall be scheduled 4-6 weeks prior to the specific activity commencing. Each prime contractor shall coordinate meeting dates.
1. Attendees: Prime contractors (Involved with direct coordination of work), 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. Meeting Minutes: Prime contractor entity responsible for specific activity being reviewed. The prime contractor shall publish meeting minutes to all attendees within 72 hours of the meeting.
3. 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 requirements.
 - k. Time schedules.
 - l. Weather limitations.
 - m. Manufacturer's written instructions.
 - n. Warranty requirements.
 - o. Compatibility of materials.
 - p. Acceptability of substrates.
 - q. Temporary facilities and controls.
 - 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.
4. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
5. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
6. 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.
7. At a minimum or unless specified in technical specifications, pre-installation conferences are required for:
 - a. Abatement / Demolition
 - b. Foundation modifications
 - c. Exterior skin / Brick Removal, Rebuild and Repointing
 - d. Exterior Skin – Curtainwall / Windows
 - e. Steel Supports
 - f. Roof Modifications

- g. Finishes (Flooring, Ceilings & Walls)
 - h. Elevator Renovations
- I. Progress Meetings: CMA will conduct progress meetings at biweekly intervals.
 - 1. Coordinate dates of meetings with preparation of payment requests.
 - 2. Attendees: In addition to Owner, Construction Manager, and Architect, each prime contractor, subcontractor, suppliers, 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.
 - 3. 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) Access.
 - 5) Site utilization.
 - 6) Temporary facilities and controls.
 - 7) Progress cleaning.
 - 8) Quality and work standards.
 - 9) Status of correction of deficient items.
 - 10) Field observations.
 - 11) Status of RFIs.
 - 12) Status of proposal requests.
 - 13) Pending changes.
 - 14) Status of Change Orders.
 - 15) Documentation of information for payment requests.
 - 4. 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.
- J. Project Phase Closeout Conference: CMA will schedule and conduct a project closeout conference, at a time convenient to Contractor, Owner and Architect, but no later than twenty (20) days prior to the scheduled date of Substantial Completion.

1. Attendees: Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect or delay Phase closeout, including the following:
 - a. Procedures required prior to inspection for Substantial Completion.
 - b. Submittal of written warranties.
 - c. Requirements for demonstration and training.
 - d. Preparation of Contractor's punch list.
 - e. Coordination of separate contracts.
 - f. Owner's partial occupancy requirements.
 - g. Preparation for next Phase.
 - h. Installation of Owner's furniture, fixtures, and equipment.
 - i. Removal of temporary facilities and controls.
 3. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- K. Project Closeout Conference: CMA will schedule and conduct a project closeout conference, at a time convenient to Contractor, Owner and Architect, but no later than ninety (90) days prior to the scheduled date of Substantial Completion of the final phase.
1. Attendees: Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect or delay Phase closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for preparing operations and maintenance data.
 - e. Requirements for delivery of material samples, attic stock, and spare parts.
 - f. Requirements for demonstration and training.
 - g. Preparation of Contractor's punch list.
 - h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - i. Submittal procedures.
 - j. Coordination of separate contracts.
 - k. Owner's partial occupancy requirements.
 - l. Installation of Owner's furniture, fixtures, and equipment.
 - m. Responsibility for removing temporary facilities and controls.
 3. Minutes: Entity conducting meeting will record and distribute meeting minutes.
- L. Coordination Meetings: CMA will conduct Project coordination meetings regularly scheduled times intervals, no less than monthly. The meeting frequency will be increased as the discretion of the CMA. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.

1. Attendees: In addition to 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 meetings shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to combined 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.
 - b. Schedule Updating: Revise combined Contractor's construction schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
 - c. Review present and future needs of each contractor 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) Work hours.
 - 10) Hazards and risks.
 - 11) Progress cleaning.
 - 12) Quality and work standards.
 - 13) Change Orders.
3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.10 Lean CONSTRUCTION PRINCIPLES

- A. Lean Construction Management: Montgomery County intends to implement the following Lean Construction Principles on this project. To the extent Lean Principles are implemented, Montgomery County will require all prime contractors to accommodate and participate.
- B. "Last Planner System" (LPS) using Pull Scheduling and Percent Planned Complete (PPC) Tracking: The project will utilize the Last Planner System to develop and implement the detailed work plans for each phase of the project based on the master project schedule. That includes Pull Plans and Percent Planned Complete (PPC) tracking that will be utilized throughout the project according to the CMA's methodology.



C. Prime Contractor Last Planner Requirements

1. Prime Contractors shall understand that the CMA will be tracking major "promises made".
2. All "promised" tasks shall be tracked in the matrix with a task description, Prime Contractor responsible, and promised completion date.
3. CMA will provide Prime Contractor feedback on their reliable promising performance during weekly Foreman's meetings.
4. CMA will provide an overall PPC rating to each Prime Contractor at the end of the project.
5. Prime Contractors and other key personnel noted in previous sections will attend pull planning meetings at the request of CMA Superintendent and/or Project Manager.
6. Actively participate in weekly work planning meetings to review past, current, and future work activities.
7. MUST prepare and submit Weekly Work Plans as agreed by the contract.
8. MUST report and track task completions on a weekly basis.

D. To implement the LPS effectively, it is critical for the Prime Contractors Foremen requires certain, specific behavior and actions on the part of the individual's firm, which are described as follows:

1. Prime Contractors foremen are expected to plan together with other trades in building a "Pull Schedule" for each major phase of work on the project in which they will be participating.
2. MUST participate in Pull Planning Sessions that his company is involved in and have necessary authority to make decisions on manpower, equipment, materials and other required resources to ensure commitments are met. (non-approved attendee, Proper notification, late, or no show, back charged for attendee's time.)

3. Has the ability to plan work for his organization and authority to make commitments to the project in order to execute that plan and/or the person that is able to commit manpower and material needs should be present at the meeting. The end goal of the last planner each week is to make legitimate and obtainable commitments.
4. MUST know and understand the latest information about the status of contract issues, submittals and shop drawings, material and equipment deliveries, RFI's and changes orders, safety training, labor, and construction equipment availability.
5. MUST attend and fully participate in Weekly Work Planning meetings (typically about an hour) and Daily Shift Startup Meetings (typically less than 15 minutes, sometime during the day as chosen by the team – not necessarily at startup).
6. Foreman/PM attend training, provided by CMA, to orient to this system. (Typically 8 hours).

E. Last Planner® System of Production Control

1. The Last Planner System of Production Control, or LPS, is an important component of lean construction and the one that has been widely implemented. The LPS was developed to produce predictable workflow and rapid learning. This produces maximum value to the Owner and Contractors by eliminating waste caused by unpredictable workflow. Its use has enabled contractors to reduce the delivery time of the project and at the same time allowed specialty contractors to improve utilization of their resources.
2. This requires team members (owner, designer, CMA, prime contractors and their sub-contractors), to make and keep commitments based on their confidence that prerequisite work, design information, materials, labor and equipment will be ready so they can start and complete installations to meet Master Schedule milestones.

F. Pull Planning Meeting

1. In the Pull Planning Meeting, the CMA will facilitate the meeting and the Prime Contractors foremen structure the flow of work and design the network of commitments by identifying hand-offs between trades.
2. Each Prime Contractors foremen is considered a "Last Planner" in the LPS, and has the responsibility to plan their activities ten – twelve weeks ahead in a "Make Ready Schedule" and to identify crew assignments for the current and next week in a "Weekly Work Plan".
3. Last Planners are asked to commit to performing work that they know can be made ready for their crews and to refuse to assign work they are not confident can be started and/or completed because it is not ready. It is this cycle of planning and commitment coupled with learning from seeing the results which creates reliable workflow.
4. The LPS is based on milestones from the Master Schedule, which are used to identify phases. The effort to determine work flow in the Phase Schedule takes place in a Pull Planning Session involving the Last Planners and in most cases the Project Manager, Owner, CMA and Designers and Prime contractor foreman/PM.
5. When this workflow plan is converted to a Gantt chart or CPM type schedule and reformatted/filtered to represent the next six-eight week's work, it becomes known as the Make Ready Schedule and is the basis of planning and constraint identification. It also identifies those activities that must be included in the Weekly Work Plan (WWP) - the commitment list for the work force.

6. Typically, the Make Ready Schedule is developed on the project scheduling system (MS Project, Suretrack, Primavera P6, etc.) and the WWP is based on an Excel spread sheet.
7. An important part of the LPS is the monitoring and reporting of the team's success in meeting their commitments and the learning developed when the failures are discussed, and improvement strategies put in place.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION**PART 1 - GENERAL****1.1 SUMMARY**

- A. General: The Construction Manager as Agent shall provide administrative, management and related services to coordinate scheduled activities and responsibilities of the Contractor(s) with each other and with those of the Construction Manager as Agent, the Owner and the Architect. The Construction Manager as Agent shall assist in coordination of the Contractors' activities in accordance with the latest Approved Master Project Schedule and the Contract Documents.
- B. Contractors shall provide the documentation of the progress of construction during performance of the Work and includes, but is not limited to:
 - 1. Preliminary Construction Schedule.
 - 2. Contractor's Construction Schedule.
 - 3. Submittals Schedule.
 - 4. Progress Schedule.
 - 5. Daily Construction Reports and Progress Reports.
 - 6. Schedule of Values and Trade Payments Breakdowns.
 - 7. Construction Survey Data.
 - 8. Material location reports.
 - 9. Field condition reports.
 - 10. Special reports
 - 11. Construction Photographs.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
 - 2. Predecessor activity: is an activity that must be completed before a given activity can be started.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Cost Loading: The allocation of the schedule of values for completing an activity as scheduled. The breakdown of the Contract Amount and assignment of specific costs to each activity in the Baseline Schedule. The sum of costs for all activities must equal the total

Contract Sum unless otherwise approved by the Owner, Architect and Construction Manager as Agent.

- C. Resource Loading: The allocation of manhours to each associated construction activity in the schedule for the purpose of determining crew size and labor allocation per activity and over the course of the project. Resources shall be loaded into the Baseline schedule and reviewed and approved at the beginning of the project by the Owner, Architect and Construction Manager as Agent.
- D. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships and schedule logic forming a network of activities in the Master Schedule Network calculations determine when activities can be performed and the critical path of Project.
- E. Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall Project duration.
- F. Event: The starting or ending point of an activity.
- G. Float: The measure of leeway or slack in starting and completing an activity
 - 1. Free float is the amount of time any single activity can be delayed without adversely affecting the early start of the following activity.
 - 2. Total float is the measure of leeway in starting or completing an activity or any activity on the same activity path without adversely affecting the planned Project completion date for the schedule network.
- H. Milestone: A key or critical point in time for reference or measurement. A milestone activity has no duration and identifies a significant date in the schedule network. Milestones can be start or finish type.
- I. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships which depicts the order and interdependencies of activities and the sequence in which work is to be accomplished.
- J. Construction Manager as Agent: referenced herein as Construction Manager, CMa or CM. Responsibilities for scheduling are defined as noted.

1.3 SUBMITTALS

- A. Contractors shall submit the following information to the CM, which shall be submitted for Architect's review and comment or information.
- B. Submittal Schedule: Submit an electronic copy of submittal schedule, within 15 day of NTP, using software, format and media storage as agreed upon, and labeled to comply with requirements for submittals. Include type of schedule ("Initial" or "Updated") and revision date and revision number.
- C. Submittals Log: An electronic version of an updated submittals log allowing the Architect live access to open and closed submittals and reports at all times, which will also be provided at weekly progress meetings or other agreed upon intervals. These logs are to be updated and

coordinated with updated construction schedules throughout the project.

- D. Start Up Construction Schedule: Within 10 calendar days after the NTP is received submit the Start Up Construction Schedule defining the planned operations detailed for the first 120 to 180 calendar days for approval. The Start Up Schedule may be summary in nature for the remaining performance period. It must be early start and late finish constrained and logically tied as specified. The Start Up Schedule forms the basis for the Initial Contractors Schedule specified herein and must include all of the required plan and program preparations, submissions and approvals identified in the contract (for example, Quality Control Plan, Safety Plan, and Environmental Protection Plan) as well as permitting activities. The Start Up Construction Schedule must be approved by the Architect, Owner and / or Construction Manager.
- E. Contractors Project Schedule Submission: Submit the Initial Project Schedule for integration into the Project Master within 20 calendar days after notice to proceed is issued. The schedule must demonstrate a reasonable and realistic sequence of activities which represent all work through the entire contract performance period. No payment will be made for work items not fully detailed in the Project Schedule.
- F. Periodic Schedule Updates: Update the project schedule on a regular basis, monthly at minimum. Provide status updates with a consistent monthly data date (typically the last day of each month) within 10 days of the data date for each update or as defined in the specifications. Update information will include AS (Actual Start) AF (Actual Finish), RD (Remaining Duration) and Percent Complete and be updated on a monthly update form. Periodic Updates shall be reviewed by the Architect, Owner and / or CM.
- G. Contractor's Construction Schedule: Submit an electronic copy of construction schedule, using Oracle Primavera P6 software in .xer format and labeled to comply with requirements for submittals. Include type of schedule ("Initial" or "Updated") and revision date and revision number. P6 will be the sole software platform for the project unless otherwise noted.
- H. Other Reports:
 - 1. Daily Construction Reports: Submit electronic copies at weekly intervals.
 - 2. Material Location Reports: Submit electronic copies at weekly intervals.
 - 3. Field Condition Reports: Submit electronic copies at time of discovery of differing conditions.
 - 4. Special Reports: Submit electronic copies at time of unusual event.
 - 5. Schedule Narrative Reports: Provide a Narrative Report with each schedule submission (including Updates). The Narrative Report is expected to communicate to the thorough analysis of the schedule output and the plans to adjust for any problems, either current or potential, which are revealed through that analysis. Include in each narrative, work completed, work planned to start in the next month, Critical Path Review, Issues that have arisen, Logic revisions during the period, deleted activities and added activities.
- I. Photographic Media: Submit for Owner's Documentation and Architect's information.

1. Digital Images: Submit a complete set of digital image electronic files using software, format and media storage as agreed upon as a Project Record Document. Submit images that have same aspect ratio as the sensor, un-cropped.
 - a. Identification: Identify electronic media with the following information:
 1. Name of Project.
 2. Name and address of photographer.
 3. Name of Architect.
 4. Name of Contractor.
 5. Date photograph was taken.
 6. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.

1.4 **QUALITY ASSURANCE**

- A. LEAN Procedures: See Section 01 31 00 – Project Management and Coordination.
- B. Pre-Scheduling Conference: Conduct conference at Project site to comply with requirements in Division 1 Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:
 1. Review software limitations and content and format for reports.
 2. Verify availability of qualified personnel needed to develop and update schedule.
 3. Discuss constraints, including work stages, interim milestones and partial Owner occupancy.
 4. Review delivery dates for Owner-furnished products.
 5. Review schedule for work of Owner's separate contracts.
 6. Review submittal requirements and procedures.
 7. Review time required for review of submittals and resubmittals.
 8. Review requirements for tests and inspections by independent testing and inspecting agencies, including mock-up testing.
 9. Review time required for completion and startup procedures.
 10. Review and finalize list of construction activities to be included in schedule including activities for Procurement, Shop Drawing Submittals and Approvals, Material Fabrication, Mockups, Phases of Construction, Inspections, Startup and Testing, Punchlist, Turnover and Owner required activities.
 11. Review procedures for updating schedule. Items to discuss include frequency of update (minimum monthly), Gathering update information / activity status, review of the draft updates, schedule revisions, recovery schedules (if required), reporting and final issuance of the update.

1.5 **COORDINATION**

- A. Schedules and Reports of Construction Activities and Separate Contractors: Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors. During Periodic Updates Coordinate with each contractor to record the status of construction and integrate into the Master Project Schedule. Each contractor shall actively participate and attend all schedule update review meetings and have input in the Master Project Schedule.
- B. Coordination of Contractors' Construction Schedules: Coordinate Contractors' Construction Schedules with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence. Review predecessors – successors for each activity and coordinate with all contractors to ensure dependent activities are documented in the schedule correctly.
- C. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities including temporary lighting.

PART 2 - PRODUCTS

2.1 SUBMITTAL SCHEDULE

- A. Preparation of Submittal Schedule: Prepare a submittal schedule arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates that contains a complete listing of submittals required by Contract. Submit the schedule to the Architect a minimum of 30 days prior to submitting any submittals grouped and regulated so as not to burden the reviewing facilities, while maintaining job progress. Organize the submittal schedule by specification section number. Each submittal is to be assigned the relevant section number and a sequential number for identification and tracking purposes. Each prime shall provide bi-weekly submittal schedule updates, including all pertinent information, until submittals are complete. Failure to submit timely and accurate submittal schedule will delay invoice processing.
 - 1. The Submittal Schedule shall be submitted for the Architect's information. Include the following information:
 - a. Title of Submittal/Description.
 - b. Submittal Number (sequential).
 - c. Scheduled date for the first submittal.
 - d. Drawing Number (if applicable).
 - e. Applicable specification Section title and number.
 - f. Name of subcontractor/vendor.

- g. Submittal category (action or informational).
- 2. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule

2.2 SUBMITTALS LOG

- A. Submittals Log: Prepare, submit, maintain and update a single live electronic version of a submittals log for the entire project, using approved software, format and media storage as agreed upon. The submittals log shall be accessible to the Architect at all times and shall contain relevant information related to submittals and the submittal process progress which will be reviewed at the weekly progress meetings or other agreed upon intervals. The logs shall include at a minimum a complete list of required submissions per the project specifications, current status, submission or resubmission date, date required, revision, submittal number and submittal description. The submittals log shall provide the Architect and CMA with the ability to filter for open and reviewed items, have ongoing access to live updates, as well as confirm receipt and response dates for every submittal. The submittal log shall be based on the CSI numbering system and the Project specifications and shall be available to Project team members.
 - 1. The submittal log shall be updated **weekly** until all submittals are received and submitted to the Architect and CMA for review.

2.3 SCHEDULE OF VALUES

- A. Contractual Requirements: Refer to General Conditions and Division 01 specifications, for contractual requirements governing schedule of values.
- B. Relation to Sections and Divisions of the Work: The schedule of values shall be related to Sections and Divisions of the Work, aggregating the total Contract Sum and shall include overhead and profit as separate line items.
- C. Schedule of Anticipated Monthly Requisition Amounts: The Contractor shall also submit a schedule of anticipated monthly requisition amounts which shall be related to the progress schedule.

2.4 CONSTRUCTION SCHEDULE, GENERAL

- A. Based on the bid schedule, sequencing, phasing and durations provided, the Contractor shall prepare a construction schedule in the format and program defined herein and which will be integrated into the Master Project Schedule prepared by the Construction Manager such that the Master Project Schedule shall be acceptable to each Contractor and binding with respect to the performance of the work of each Contractor for its own part. The process to develop the Master Project Schedule will be facilitated by the Construction Manager with participation by each Contractor. The Master Project Schedule will be the basis for measuring progress of work and performance and, upon acceptance by the CMA, Owner and A/E, the Contractor(s) will be the schedule of record.

The CMA shall be the Scheduler of Record for the Project Master Schedule. Each Contractor shall have input creating and developing his / her own schedule activities for their work. Each Prime Contractor will submit a listing of his/her activities in the appropriate format to the CMA

for input in the Master Project Schedule. Activities should have Description, Duration, Manpower to complete that Activity, Predecessors and Successors, and sequence of construction. In Addition, each Prime Contractor will list out all required submittals, shop drawings, mockups, inspections, architect / engineers review and fabrication time for all materials required on the project. The contractors schedule submission shall allow time for things such as, review time, inspections, site visits, fabrication, delivery, cure / drying to not affect the progress of work. Each Prime Contractor shall provide an acceptable construction schedule within 20 days of NTP which is compliant with the bid schedule and includes all tasks required to complete the contractor's work. All costs incurred by the Contractors in preparing and updating the Schedules are included in the Work of the Contract.

- B. Computer Scheduling Software: Prepare schedules using current version of a as defined below.
 - 1. Use Oracle Primavera P6, version 16 or later. Include electronic schedule in .xer format with all schedule submissions. (use of an earlier version or different scheduling program requires the approval of the CMA)
 - 2. There shall be no additional costs for updating to the most current version of the required software even if this occurs during the project.
- C. Contractor's Construction Schedule Preparation
 - 1. Develop the Contractor's Construction Schedule no later than twenty (20) days after Contract Award, NTP which timeframe is established to allow for the Project Master Schedule to be prepared within thirty (30) days.
 - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of CMA, Architect's and / or Owner's review of the schedule.
 - b. Contractor(s) to submit cost and resource loaded schedule. Included with the contractors initial construction schedule submission will be allocation of cost and resources (manhours) loaded in the contractors activities. Costs shall not be frontloaded and equal the total value of the contractors contract sum. The cost loaded schedule will be the basis for monthly progress payments and tracking of work in place. Resource loading will include total manhours per activity and loaded as a resource into the Master Project Schedule for each work activity. The cost and resource loaded schedule will be approved by the Architect, Owner, and / or CMA.
 - 2. CMA will develop the Master Schedule WBS (Work Breakdown Structure), with input from the Contractor(s); the Contractor(s) integrate their activities and send to CMA for incorporation into Master Project Schedule.
 - 3. The Construction Manager will facilitate schedule workshops to develop the Project Master Schedule. Each Contractor shall attend all workshops required to review the integration of the Contractor's Construction Schedules into the Master Project Construction schedule. These meetings will be required until the final Master Project Schedule is developed and accepted by all parties. Additional schedule workshops that are required will not constitute recovery of additional monies by the Contractor(s).
 - a. The CMA shall integrate the contractor's Construction Schedule into the

Master Project Schedule. The contractors, in conjunction with the CMa, will coordinate all schedule activities, logic and other relevant schedule requirements including those of the various other Contractors into the Master Project Schedule. The Master Schedule development and coordination will be deemed complete until all entities agree, and all schedule requirements have been satisfied. The CMa will serve as the record-keeper of the Master Project CPM Schedule with input and accountability by all *separate* Contractors. The Master Project Schedule will be used to measure progress throughout the duration of the project. All contractors will partake in the Periodic updates of the Master Project Schedule.

4. Each Prime Contractor shall be responsible for the development of schedules subject to all the same requirements and appropriate for integration by the Construction Manager into the Master Project Schedule. All Prime Contractors are required to submit Schedule Activity Listings in an acceptable format to the CMa. The CMa shall have the right to reject any format that doesn't meet the CMa requirements. All Prime Contractors agree in advance that the integration of schedules is an iterative process and that durations are subject to adjustment, within reason, to align with the properly scheduled work of other prime contractors and subcontractors.
 5. No claims for delay or additional costs associated with the work of preparing, updating and modifying schedules in order to compile an acceptable Master Project Schedule will be entertained by the Owner.
- D. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques that meets the qualifications noted below. Submit qualifications for approval to CMa within 10 days of the NTP.
 2. Meetings: Scheduling consultant shall attend all meetings related to Lean Process/Pull Planning, Development of the Project Master Schedule, Project progress meetings, Schedule update workshop meetings, alleged delays, and time impact.
 3. Qualifications: Project scheduler or consultant shall have a minimum of 8 years scheduling experience with similar projects using Primavera P6. Scheduler qualifications for each prime contractor shall be submitted within 10 days of the Notice to Proceed. The CMa has the right to approve or disapprove of any proposed scheduling consultant.
- E. Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify Critical Path and subsequent near-Critical Paths.
1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
 - a. Award and procurement of trades/subcontractors
 - b. Preparation and processing of submittals.
 - c. Purchase of materials.
 - d. Delivery.

- e. Fabrication. Mobilization and demobilization.
 - f. Utility interruptions.
 - g. Installation.
 - h. Work by Owner that may affect or be affected by Contractor's activities.
 - i. Testing and Inspections
 - j. Punch list and final completion.
 - k. Final Inspections and Turnover (including required by the AHJ)
 - l. Activities occurring following final completion.
2. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often necessary to produce the CPM schedule within the limitations of the Contract Time.
3. Contract Modifications: For each proposed contract modification and concurrent its submission, prepare a Time-Impact Analysis (TIA) using a network fragment to the effect of the proposed change on the master project schedule.
- a. As determined by CPM analysis, only delays in activities which affect critical path dates and the overall Substantial Completion Date required by the Contract will be considered for a time extension.
- All TIAs shall be contemporaneous in nature and submitted within 15 days of the delaying event. It is the contractor's duty to demonstrate the alleged delay is solely impacting the Critical Path and not concurrent with any other delays. Delays due to weather and / or Force Majeure will be deemed non-compensable, and the remedy will be time only (no compensation).
- b. Extensions of time granted to one Prime Contractor shall not affect any other Prime Contractor or any subcontractor except those identified and approved as part of the extension.
 - c. If the Contractor requests a time extension of any milestone date or Contract completion date, the Contractor shall provide documentation as required by the CM to enable the CM to determine whether a time extension is appropriate under the terms the Contract. The Contractor shall submit the Time Impact Analysis which clearly identifies the delay or impact and its effect on the Critical Path. The impact must be solely on the Critical Path in order to recover time and/or compensation for the delay. The contract completion date will be adjusted only for causes specified in the Contract documents.
4. Initial Issue of Schedule: Prepare initial network diagram from an indicating straight "early start-total float." Identify critical activities. Prepare reports showing the following:
- a. Contractor or subcontractor and the Work or activity.
 - b. Description of activity.
 - c. Main events of activity.
 - d. Immediate preceding and succeeding activities.
 - e. Early and late start dates.
 - f. Early and late finish dates.
 - g. Activity duration in workdays.
 - h. Total float or slack time.
5. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

- a. Identification of activities that have changed.
 - b. Changes in early and late start dates.
 - c. Changes in early and late finish dates.
 - d. Changes in activity durations in workdays.
 - e. Changes in the critical path.
 - f. Changes in total float or slack time.
 - g. Changes in the Contract Time.
 6. Use "one workday" as the unit of time for individual activities. Nonworking days and holidays shall be incorporated into the schedule in order to coordinate with the Contract Time.
 7. The Contractor shall not schedule, allow or direct materials or products to be installed prematurely when it is obvious that such materials may be damaged by his own subsequent work or that of another Contractor. When recognized construction procedures or design requirements prescribe that materials be installed before execution of other work which may damage or deface such completed work, the Contractor shall then take such steps as are necessary to protect such completed work.
- F. Work Breakdown Structure: Format schedule using Work Breakdown Structure (WBS) to delineate procurement packages, phases, work areas, etc. The base WBS for the project will be developed by the contractor(s) in conjunction with the Construction Manager. Develop the WBS to sufficiently organize and group activities so workflow can be easily understood. The Construction Manager shall have the right to reject or modify the Contractors proposed WBS.
1. Contractor(s) shall prepare schedule activities for their respective work including logic, relationships, durations, manpower, cost, and sufficient detail as required by the Construction Manager.
- G. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- H. Activities: Treat each story or separate area as a separate Work Breakdown Structure (WBS) for each main element of the Work. Comply with the following:
1. Activities shall be sufficiently detailed to indicate each element of work, by specific trade and area the work is taking place.
 2. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by CMA. Written approval will be required for activities greater than 20 days.
 3. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 4. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

5. Startup and Testing Time: Include not less than fifteen (15) days for startup and testing. Start up activities must be sufficiently detailed.
 6. Milestone: the CMA will provide a list of standard milestones to be incorporated into the contractor's schedule. Milestones shall contain logic and be tied with relationships (no constraints). Milestones will identify significant start and finish dates within the schedule for the purpose of measuring progress and completion of major elements or areas of work.
 7. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Architect's and Construction Manager's administrative procedures necessary for certification of Substantial Completion. Allow time for local authority (AHJ) inspections to obtain interim approvals, C of O and/or Substantial Completion Certificate.
 8. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items on any phase and punch-list items and close-out requirements for final completion at final phase.
- I. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Phasing: Arrange list of activities on schedule by phase.
 2. Work under More Than One Contract: Include a separate activity for each contract.
 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work". Delivery dates indicated stipulate the earliest possible delivery date.
 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section 01 11 00 "Summary of Work". Delivery dates indicated stipulate the earliest possible delivery date.
 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction
 - b. Limitations of continued occupancies and egress / ingress pathways by existing occupants.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Enabling work or temporary construction measures to support future Phases
 - g. Provisions for future construction.

- h. Seasonal variations.
 - i. Environmental control.
- 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.
 - b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
 - m. Final Inspection and turnover.
- 8. Construction Areas or Area Separations: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. At a minimum the schedule should include the following:
 - 1. WBS Element
 - 2. Floor
 - 3. Building / Wing
 - 4. Sub Floor / Area
 - 5. Construction Category (i.e.: Sitework, Structure, Envelope, Roofing, MEPS Systems / Rooms, Vertical Transportation, Interior Fit out, Risers, Punchlist & Turnover)
 - 6. Other relevant project specific items

9. Milestones: Include milestones indicated in the Contract Documents Bid schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion and the following interim milestones:
 - a. Project Award
 - b. NTP (Commencement)
 - c. Foundation Start/Pad Ready
 - d. Foundation Complete To Grade
 - e. Structure Start
 - f. Structure Top-Out
 - g. Last SOMD Pour
 - h. Facade Start
 - i. Façade Complete
 - j. Roof Complete
 - k. Temp Dry-In (ROOF & CW/WINDOWS COMPLETE)
 - l. Permanent Power Available (INCOMING SERVICE TO GEAR)
 - m. Conditioned Air Available
 - n. Start Fitout
 - o. Start Drywall
 - p. Start Ceiling Grid
 - q. Start Flooring
 - r. Start Punchlist (CONSTRUCTION COMPLETE / CLEAN)
 - s. Complete Construction For Floor / Area Turnover
 - t. Elevators Complete (STATE INSPECTION)
 - u. Substantial Completion / C OF O
 - v. Final Completion
10. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests. Schedule of value / S-Curve of Plan vs Actual costs as is relates to the schedule in order to forecast the construction costs per month or required time interval.
11. Resource Loading Requirements:
 - a. Activities shall be loaded with resource assignments (manhours) within the Master Project CPM Schedule. Resource loading should reflect total manhour for each activity within the schedule. Resources shall be in units of hours and designated as a single material resource in the scheduling software (P6). Time Period Admin preferences must remain default "8.0hr / day, 40 hr / week, 172 hr / month, 2000 hr / year". Calendar setting will be 8.0 hr / day.
12. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the master project schedule.
 - a. Time Impact Analysis shall be performed in the following manner.
 1. Identify the Impacting event
 2. Model the event with the appropriate detail of activities (creating a fragnet)
 3. Estimate the duration for the new activities associated with the impact
 4. Add sequence and relationships to the added activities.

5. Insert the new fragnet into a copy of the Master Project Schedule.
 6. Calculate the schedule and measure the effect of the Impact on the Project Completion Date and directly affected milestone.
 7. Review the Time Impact Analysis and determine the impacts as a result of the change, and review a potential recovery plan.
- J. Schedule Updating Process: Periodic updates will be performed on at least a monthly basis (if not more frequently). Each Contractor shall participate in the monthly update process. The established procedures, as defined in this specification section, will be utilized for progress monitoring and updating the Project Master Schedule, reporting and payment requests.
1. Schedule Updating Process: At no less than monthly intervals, as deemed necessary by the CMA, contractors will update the schedule to reflect actual construction progress and activities. Schedule updates will be issued on the 28th of each month (or mutually agreed upon time frame each month). The CMA will send out 'Schedule Update Forms' on a monthly basis, 2 weeks prior to the date established for the issuance of the Project Master Schedule Update. All Contractors will provide markups to the update forms with his / her schedule status information noting but not limited to all progress for their activities including Actual Starts, Actual Finishes, Remaining durations, and Projected Starts / Finishes. The contractor shall provide the update forms four (4) days following receipt of the form. The CMA will update the Project Master Schedule and issue a draft schedule update utilizing the information provided by the contractor(s) in the update forms. A schedule progress meeting workshop will be held approximately one week after to review the schedule, contractor updates, request sequence and/or logic changes and other comments. Within 2 days of the workshop meeting, each Contractor shall issue additional schedule updates and/or comments to be integrated into the updated Project Master Schedule. The CMA shall integrate changes and reissue the schedule to the Contractor(s) within 3 days and become part of the project record.
 2. Contractor Update Forms
 - a. CMA will distribute Schedule Update Forms each month. Contractors will provide updates to the CMA by the 24th of each month.
 - b. Contractor shall provide a detailed report and written narrative with schedule update form that indicates all changes, including, but not limited to, changes in logic, durations, actual starts and finishes, added / deleted activities, and activity durations. Refer to timing as noted in this specification.
 1. As the Work progresses, indicate final completion percentage for each activity.
 2. All proposed logic changes by the contractors shall be proposed in conjunction with the update form submission. The contractor is responsible to identify the reasons for such changes and potential impact to other contractors and/or subcontractors. The proposed change will be reviewed during the monthly schedule workshop.
 3. Distribution and Acceptance: CMA shall issue updated integrated Master Project Schedule to Contractors, Architect and Owner within three (3) days following receipt of Contractors comments following the schedule workshop.

- a. Contractors shall review and accept the updated Master Project Schedule within three (3) days of receipt or, within the same period, notify Construction Manager as Agent of nonacceptance and reason therefore. (failure to respond will be deemed as acceptance of the schedule update by the Contractor).
 - b. Any notification shall be fully supported with specific details, references and other relevant data.
 - c. Contractors shall distribute accepted revised Master Project Schedule and any coordinated sub-schedules to their subcontractors within one (1) day of acceptance.
4. The CMA will issue the Master Project Schedule updates on a monthly basis with narrative and reports as follows.
- a. Full Schedule report – sorted by WBS and Start/Finish
 - b. 4 week look-ahead construction schedule
 - c. Milestone Report Listing all Milestones and Level of Effort Activities
 - d. Critical Path Report – sorted by Total float path then Start/Finish
 - e. Predecessor – Successor Report but Activity ID
 - f. Narrative identifying critical issues impacting the schedule

K. Contractor Schedule Reports:

1. CPM Reports: In conjunction with the contractor's update forms and the monthly CPM schedule update process, the contractor shall submit reports via the web-based project management software. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in workdays (as based upon the schedule calendar utilized in the Scheduling Software).
 - a. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
 - b. Predecessor-Successor Report: List of all activity predecessors and successors for each activity, sorted in ascending order by activity number and then early start date, or actual start date if known.
 - c. Total Float Report: List of activities sorted in ascending order of total float, then by Start Date for each activity followed by Finish Date for each activity.
 - d. A written schedule narrative to include the following at a minimum:
 1. Executive Summary
 2. Summary of work completed since the previous update.
 3. Summary of Major Milestones completed and progress toward the next milestones

4. Status of major deliveries
 5. Items affecting progress with listed deviations from the previous month
 6. Upcoming work planned
 7. Schedule revisions
 8. Basis and assumptions
 9. Impacts due to severe or unusually extreme weather conditions.
2. The contractors schedule report shall be issued with the submission of the contractors update form. Failure to provide the required update forms and reports is required before Applications for Payment are processed.
 3. Upcoming Work Summary: Contractor to prepare summary report indicating activities scheduled to commence prior to submittal of next schedule update. Summarize the following issues:
 - a. Unresolved issues.
 - b. Unanswered Requests for Information.
 - c. Rejected or unreturned submittals.
 - d. Notations on returned submittals.
 - e. Pending modifications affecting the Work and Contract Time.
 - L. Recovery Schedule: When periodic update indicates the Work is ten (10) or more work days behind any milestone as identified in section 2.4.1.9, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and equipment required to achieve compliance, and date by which recovery will be accomplished. Recovery plan should be based on actual data from subcontractors, suppliers and vendors with associated manpower listed. The Contractor shall take steps as necessary to improve the progress and shall submit for review, revised schedules to demonstrate that the rate of progress will be regained; without additional cost to the Owner.

2.5 CONTRACTORS LOOKAHEAD SCHEDULE

- A. 3 Week Look-Ahead Schedule: Contractors shall submit an electronic 3 Week Look-Head Schedule each Friday for incorporation into a master project 3 Week Look Ahead Schedule. Contractors will utilize the look ahead schedule template provided by the CMa. Weekly submissions will be in a live MS excel file format.
 1. General Contractor Prime shall incorporate all prime contractors Look-Ahead Schedules into a singular file on a weekly interval and distribute the schedule to the entire project team in a live MS excel file format each Monday unless an alternate date is identified by the CMa. 3 Week Look-ahead must include area of work, floor level and estimated manpower for the activity. Format should be at minimum MS Excel schedule template provided by the CMa and identify relationships to other activities.

The Look-Ahead schedule should be consistent with the Project Master Schedule. Any deviations including but not limited to logic, overall sequence, and/or duration must be identified. Deviations will be discussed at project meetings.

2.6 **STARTUP CONSTRUCTION SCHEDULE**

- A. Startup Construction Schedule is intended to be preparatory to preliminary Pull Planning activity defined in Lean Procedures. The Startup Construction Schedule should generally reflect milestones contained in Bid Schedule and Master Project Schedule as defined in the Contract Documents. Included with the Startup Construction Schedule framework should be a fully developed Work Breakdown Structure (WBS) for the entire project. The WBS will be further detailed as the Master Construction Schedule is developed. This initial schedule should be considered preliminary and prepared only to allow Contractor to participate knowledgeably in a Pull Planning process that will result in further direction in response to constraints determined jointly by the Contractor(s), A/E, Owner and the Construction Manager.
 - 1. Contractor(s) shall prepare a Startup Construction Schedule including Milestones and detailed WBS and submit to the CMA within ten (10) days of the NTP. The Startup Construction Schedule shall include all activities anticipated in the first four to six months of the project and include but not limited to procurement, submittals, mobilization and enabling, coordination and construction. The schedule shall be developed in Primavera P6.
- B. Bar-Chart Schedule: Submit startup, horizontal, bar-chart-type construction schedule. Bar-chart or Gantt Schedule shall consist of Activity ID, Activity Description, Original Duration, Remaining Duration, Early Start, Early Finish and define the entire Contractual Construction Timeline.
- C. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line. Outline significant construction activities for first one hundred twenty (120) days of construction. Indicate all Milestones into the Startup Schedule for further development in Pull Planning Sessions. Include fully detailed Work Breakdown Structure with skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- D. The Startup schedule, compliant with the contract requirements, shall be submitted prior to the first payment application request.

2.7 **PROGRSS REPORTS**

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions.

7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events (refer to special reports).
 10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial Completions and occupancies.
 19. Substantial Completions authorized.
- B. Construction Survey Data: Take settlement readings of the Work at a predetermined number of points selected by the Architect. Take readings weekly until the Work is substantially completed or until such time as the Architect directs. Record survey data and submit to the Architect on a weekly basis. Furnish certification from a Registered Land Surveyor who shall verify periodically that portions of the Work are located in accordance with the Drawings and at the required elevations. Upon completion of foundation walls, submit to the Architect a certified survey showing that dimensions, elevations, angles and the location of the building is in accordance with the Contract Documents. When enclosing walls are completed, submit a survey certifying their location and plumbness.
- C. Material Location Reports: At appropriate intervals, or as requested, prepare a comprehensive list of materials delivered to and stored at the Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list, a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.
1. Material stored prior to previous report and remaining in storage.
 2. Material stored prior to previous report and since removed from storage and installed.
 3. Material stored following previous report and remaining in storage.
- D. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare a detailed report. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.8 SPECIAL REPORTS

- A. General: Submit special reports directly to CMa within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise CM in advance when these events are known or predictable.

2.9 CONSTRUCTION PHOTOGRAPHS

- A. Digital Images: Provide images in uncompressed PDF, TIFF or JPEG format, produced by a digital camera with minimum sensor size of 8.0 megapixels.
- B. The contractor shall provide a minimum of 25 digital photo images per day when its working on site. Photos shall be submitted as separate files with the daily report. Photos shall be time stamped and labeled to identify location and/or area.
- C. 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.
- D. Maintain key plan with each set of construction digital images that identifies each photographic location.
- E. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images in the field office at Project site, available at all times for reference. Identify images same as for those submitted to CMa and Architect.
- F. Quantity and Timing of Construction Photographs
 - 1. Preconstruction Photographs: Before starting construction, take digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
 - 2. Periodic Construction Photographs: Take color, digital 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.
- G. Final Completion Construction Photographs: Take color digital photographs after date of Substantial Completion for submission as Project Record Documents

END OF SECTION

SECTION 01330 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Division 1 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
 - 2. Division 1 Section "Substitutions".
 - 3. Division 1 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 4. Division 1 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 5. Division 1 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 6. Division 1 Section "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."
- C. Basis-of-Design: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

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

1.4 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - 4. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files: Electronic digital data files of the Contract Drawings may be provided by Architect for Contractor's use in preparing submittals.

1. Architect will furnish each Contractor requesting one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement provided by the Architect.
 - c. Each contractor or subcontractor will be charged \$150.00 for this service.
- B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 7 days for review of each resubmittal.
 4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 15 days for initial review of each submittal.
 5. Concurrent Consultant Review: With Architect's approval submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow 15 days for review of each submittal. Submittal will be returned to Architect before being returned to Contractor.
- D. Options: Identify options requiring selection by Architect.
- E. Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those

requested by Architect on previous submittals. Include same identification information as related submittal.

- F. Deviations: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information for Contractors proposed deviations from requirements in the Contract Documents. Deviations also include minor variations and limitations. Include same identification information as related submittal
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Action Submittals: Submit pdf copy via email
 - 2. Informational Submittals: Submit pdf copy via email
 - 3. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: 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 30 by 42 inches.
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file

- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - c. All interior samples shall be submitted simultaneously. All exterior samples shall be submitted simultaneously
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit 2 full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

- a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. PDF electronic file, or
 - b. Three paper copies of product schedule or list unless otherwise indicated. Architect will return two copies.
- F. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- G. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal for accuracy and completeness and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Division 1 Section "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.
- D. Submittals must be reviewed and approved for installation by the C.M./G.C. prior to sending to the Architect. Submittals not marked as such or obviously not even reviewed by the C.M./G.C. will be returned (not reviewed).

- E. Submittals received by the Architect marked "Not for Construction" will not be reviewed by the Architect.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may be returned by the Architect without action.
- F. Submittals obviously not reviewed by the Contractor will be returned by the Architect without action.

END OF SECTION 01330

SECTION 01 41 00 - EXTERIOR WALL CONSTRUCTION MOCK-UP

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 GENERAL

- A. The General Contractor is responsible for constructing a mock-up as follows:
- Build mockup of wall area where directed by the Architect.
 - All sub-contractors shall provide materials that penetrate the exterior wall.
 - Photographic documentation of mock-up shall happen when approved at each phase and be printed and posted in the trailer.
- B. Related Sections include, but not limited to the following:
- Division 5 Section "CFMF Framing",
 - Division 6 Section "Sheathing"
 - Division 7 Sections Façade materials
 - Division 8 Sections "Windows".

1.3 QUALITY CONTROL

- Quality Control
 - Before installing portions of the Work requiring mockups, build mockups for each form of construction and exterior finish required to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - Mock-up to be constructed in 2 phases (review and approval of phase 1 to be completed prior to construction of phase 2):
 - Phase 1: Wall construction including studs, insulation, sheathing, girts, exterior wall penetrations (i.e.: conduit and pipe), window, concealed sealants
 - Phase 2: Installation of all exterior finishes (including exposed sealants).

PART 2 - PRODUCTS

2.1 MATERIALS

- Construct the exterior wall mock-up, using materials specified in other Sections for the completed Work; comply with the following:
 - Construct exterior wall complete with metal studs, sheathing, insulation, & damp-proofing. Allow for installation of a storefront window in both terra cotta and HPL

- Include exterior wall materials in all types and sill pieces.

- Include roof scupper

PART 3 - EXECUTION

3.1 MOCK-UP_

- General: Refer to the Drawings for exterior elevation and construct wall as noted below.
 - Build mockup of typical wall area where directed by the Architect.
 - Build mockups approximately 72 inches long by 72 inches high, but not less than required to show all installation requirements.
 - Clean exposed faces of mockups with masonry cleaner indicated.
 - Coordinate mock-up review with regularly scheduled meeting date. Notify Architect in advance of the proposed mockup review date.
 - Protect accepted mockups from the elements with weather-resistant membrane.
 - Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - Acceptance of mockups is for color, installation techniques, moisture management
 - Acceptance of mockups does not constitute approval of deviations from the Contract Documents contained in mockups, unless such deviations are specifically approved by Professional in writing.
 - Demolish and remove mockups when directed, unless otherwise indicated.

END OF SECTION

SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS**PART 1 - GENERAL****1.1 SUMMARY**

- A. General: This Section specifies administrative and procedural requirements for Temporary Facilities and Controls.
- B. Administrative and Procedural Minimum Actions: 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.
- C. Arrangement for, Provision and Maintenance of Temporary Facilities and Controls: Arrange for, provide and maintain temporary facilities and controls as required for the proper and expeditious prosecution of the Work. Pay 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.
- D. Acceptable Locations for Temporary Connections: Provide and maintain temporary connections to utilities and services in locations acceptable to the Owner, Architect, CMA and local authorities having jurisdiction thereof. Make installations in a manner subject to the acceptance of such authorities and the Architect. Remove temporary installations and connections when no longer required and restore the services and sources of supply to proper operating condition.

1.2 SUBMITTALS

- A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar procedures performed on temporary utilities.
- B. Implementation and Termination Schedule: Submit a schedule indicating implementation and termination of each temporary utility within 15 days of the date established for commencement of the Work.

1.3 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations and 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. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.4 PROJECT CONDITIONS

- A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner and CMA, change over from use of temporary service to use of the permanent service.
- B. 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.

1.5 EQUIPMENT

- A. General: Provide new equipment, or undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Heating Units: Provide 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.

1.6 TEMPORARY ELECTRICITY AND LIGHTING

- A. Temporary Lighting System: 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. There is currently power and temporary lighting left from Phase 1 of the project. The temporary lighting system shall be maintained to afford general illumination in areas of the

Project and any additional illumination, where necessary, in the areas of the Project where work is being performed. Temporary wiring shall be maintained in a safe manner and utilized so as not to constitute a hazard to persons or property.

- B. Permanent Power and Lighting System: 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.
- C. Removal of Temporary Electrical Equipment and Wiring: At the completion of the Work remove temporary electrical equipment and wiring and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

1.7 TEMPORARY HEATING, COOLING AND VENTILATING

- A. Temporary Heat and Maintenance of Temperature: Provide temporary heat as required during construction to protect the Work from freezing or frost damage and to ensure suitable conditions for the construction operations of trades. Where work is being conducted, maintain the temperature as specified in the various sections of the Specifications but not less than 45 deg. F. Do not allow the temperature to reach a level which will cause damage to any portion of the Work. N/A for work on roof levels.
- B. Removal of Temporary Heating Equipment and Piping: At the completion of the Work remove temporary heating equipment and piping and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.

1.8 TEMPORARY WATER

- A. Drinking Water: Furnish drinking water with suitable containers and cups for use of employees. Locate drinking water dispensers where work is in progress.
- B. Drainage or Collection of Water: Make provisions for drainage or collection of excess or spilled water.
- C. Removal of Temporary Water Service Equipment and Piping: At the completion of the Work, remove temporary water service equipment and piping and replace worn or damaged parts of the permanent system. Leave equipment in first-class condition equal to new.
- D. Temporary water service in the building will be provided by the Plumbing Prime Contractor.

1.9 TEMPORARY SANITARY FACILITIES

- A. The GC Prime Contractor will provide and maintain temporary sanitary facilities for use by all trades. Provide sufficient facilities for the number of workers on site. Clean and sanitize the facility at a minimum of two times a week. Adjacent to the temporary sanitary facilities, provide and maintain temporary hand wash stations with water, hand soap and hand sanitizer.
- B. All contractors are responsible to wipe down and clean tools and surfaces on a periodic basis with virucide cleaners and other measures necessary to protect workers. GC will be responsible to wipe down and clean public surfaces within project fence including gates as per CDC Guidelines and OSHA guidance on preparing workplace for COVID 19. In addition, temperature

screening will not be provided by Montgomery County. Contractors will be responsible for any temperature screening required throughout the entire phase.

1.10 TEMPORARY FIRE PROTECTION

- A. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.
- B. Fire Watch: All Prime contractors are responsible for providing fire watch for their scope performed. Fire watch shall be performed per OSHA standards and with a hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure. Fire watch commences at the completion of hot work. Fire watch shall last minimal 1 hour beyond the completion of hot work, and 2 hours on all roofs, within existing or occupied buildings or over flammable materials which cannot be removed. All hot work and Fire Watch activities on or within existing or occupied buildings shall be coordinated 72 hours in advance with the CMA and Owner.

1.13 TEMPORARY FENCE

- A. Maintenance of a Temporary Fence: maintain a temporary galvanized fence to enclose the area at the job site and to effectively guard and close in the designated area. gates of substantial construction, cross-braced, hung on heavy strap hinges, with suitable hasps and padlocks.
- B. Removal of Temporary Fence and Barricades: Remove the fence upon completion of the Work or at such time before final completion as directed by the CMA. upon inspection and acceptance.
- C. Reference Site Plan & Logistics plans. Temporary fence will be provided and maintained by the General Construction Prime Contractor to secure construction areas until this work is completed and accepted by the CMA.

1.14 SECURITY AND PROTECTION

- A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.
- B. Precautions Against Fire: Take adequate precautions against fire, keep flammable material at an absolute minimum and ensure that such material is properly handled and stored. Except as otherwise provided herein, do not permit fires or open salamanders in any part of the Work.
- C. 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, waterways and subsoil might be contaminated or polluted, or that other

undesirable effects might result. Avoid use of tools and equipment which produce harmful noise. Restrict use of noise making tools and equipment to hours that will minimize complaints from persons or firms near the site.

1.15 SURFACE WATER AND SNOW CONTROL

- A. Removal of Snow and Ice: Remove snow and ice as necessary for the protection and performance of the Work.

1.16 PROJECT IDENTIFICATION AND SIGNS

- A. Display of Signs or Advertisements: No signs or advertisements will be allowed to be displayed on the premises without the acceptance of the Owner and CMA.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: For temporary construction, provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by CMA. Provide materials suitable for use intended.
- B. Chain-Link Fencing: Minimum 2 in. mesh, 0.148 in. thick, galvanized steel, chain-link fabric fencing; minimum 8 ft. high with galvanized steel pipe posts; minimum 2-3/8-in. OD line posts and 2-7/8-in. OD corner and pull posts, with 1-5/8-in. OD top rails. Provide galvanized barbed-wire top strand if required for security.
- D. Gypsum Board: Minimum 1/2 in. thick by 48 in. wide by maximum available lengths; regular-type panels with tapered edges. Comply with ASTM C36 and Section 09 21 16 "Gypsum Board Assemblies".
- E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rock wool; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively. Comply with and Section 07 21 00 "Thermal Insulation".
- F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.
- G. Water: Potable.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Location of Facilities: Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required. Coordinate with all other Primes and CMA.
- B. Provision for Ready for Use Facilities: Provide each facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 SUPPORT FACILITIES INSTALLATION

- A. Location: Locate storage sheds, sanitary facilities, and other temporary construction and support facilities for easy access and as approved by the Owner and CMA. Note: Field Offices will be located on the 10th Floor of One Montgomery Plaza (OMP)
- B. Incombustible Construction: Provide incombustible construction for offices, shops, and sheds located within construction area Comply with NFPA 241.
- C. Maintenance of Support Facilities: Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

3.3 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage caused by freezing temperatures and similar elements.
- C. Water-filled Piping: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.
- D. Termination and Removal: Unless indicated otherwise, Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
- E. Property of Contractor: Materials and facilities that constitute temporary facilities are the property of Contractor. Owner reserves right to take possession of Project identification signs.

END OF SECTION

SECTION 01 56 39 –TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

I.1 SUMMARY

- A. Section Includes:
 - 1. General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.
- B. Related Requirements
 - 1. Division 31 Section "Erosion and Sedimentation Control"
 - 2. Specifications on Drawings including Erosion and Sedimentation Control Notes.

I.2 DEFINITIONS

- A. Protection Zone: Area surrounding individual trees, groups of trees, or other vegetation, to be protected with tree protection fencing, during construction and indicated on drawings.
 - 1. Tree protection fencing indicated on Drawings defines the limits of the protection zones, and where tree protection fence is not indicated as a closed polygon, then the protection zone shall be considered as the area behind the fencing where vegetation occurs and under tree canopies.
- B. Protection Plan: Plan and descriptions indicating existing conditions, protection and pruning requirements for tree trunk, branches, and roots.
- C. Project Landscape Architect: ThinkGreen LLC
- D. Owner: Montgomery County
- E. Owner's Representative: Project Manager or Project Management Company employed by the Owner. The Owner may delegate specific Owner's Representative responsibilities to the Architect, Landscape Architect and Engineer.

I.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: Tree Protection Fencing, if different than construction fence.
- C. Tree Pruning Schedule: Written schedule detailing scope and extent for pruning of trees to remain that interfere with or are affected by construction.
- D. Certification: From Contractor, certifying that trees indicated to remain have been protected during construction according to the Tree Canopy / Tree Root Zone Protection Plan and recognized standards and that trees were promptly and properly treated and repaired when damaged

1. Attach letter from Contractor's Arborist describing protection/pruning they were involved with, if applicable.
 2. Landscape Architect will field-verify compliance with the Tree Canopy / Tree Root Protection Plan.
- E. Maintenance Recommendations: From Contractor's Arborist, for care and protection of trees affected by construction during and after completing the Work, based on requirements herein and as required for care and protection of trees.
- F. Existing Conditions: Photo documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damaged caused by construction activities.
- G. Protection Plan: submit plan prior to the start of any site construction work; include input from Owner's Representative and Landscape Architect; include entire site showing accurate trunk locations and drip-line dimensions of all trees on the project site, limits of construction, locations of tree canopy/tree root protection zones; and show appropriate protection measures.
- H. Written Guarantee: indicating that workers and equipment will not enter protection zones during construction without first getting approval from the Landscape Architect.

I.4 QUALITY CONTROL

- A. Arborist Qualifications: Certified Arborist as certified by ISA, licensed arborist in jurisdiction where Project is located, current member of ASCA, or registered Consulting Arborist as designated by ASCA.
- B. Preinstallation Conference: Schedule and conduct conference to Landscape Architect and Contractor's Arborist.

I.5 PROJECT CONDITIONS

- A. The following practices are prohibited within protection zones:
1. Storage of construction materials, debris, or excavated material.
 2. Parking vehicles or equipment.
 3. Foot Traffic (except for landscape planting, seeding, and maintenance)
 4. Erection of sheds or structures.
 5. Impoundment of water.
 6. Excavation or other digging unless otherwise indicated.
 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
 8. Vehicular traffic and equipment traffic.
 9. Demolition unless otherwise indicated.
 10. Storage and spillage of gasoline, fuel oil, harmful chemicals and other deleterious materials.
 11. Runoff from cleaning of concrete equipment and other deleterious materials.
 12. Re-grading unless indicated on Drawings.

- B. Do not direct vehicle or equipment exhaust toward protection zones.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

I.6 SUPERVISION

- A. Contractor's Arborist will provide supervision pruning of roots, and excavation at protection zones.
 - I. Contractor's Arborist will prune tree and shrub trunks and branches, and will supervise the pruning by the Arborist's crew.

I.7 LIABILITY

- A. Damages from Intrusions: The Contractor will be held liable for damages to protected trees and root zones caused by unauthorized intrusions into the protection zones during the construction period.
- B. Damages to Tree Branches: The Contractor will be held liable for damages incurred to tree branches that extend over protective fencing and to trees or other plant material located on the site that are not indicated for removal.
- C. Remedial Action: The Contractor will be held liable and responsible for remedial measures required to treat broken limbs, or damaged trees and roots, or for the unauthorized removal of existing trees or plant material. Remedial treatments and actions shall be completed by the Contractor's Arborist, and will be reviewed by the Landscape Architect.
 - I. If the Contractor's remedial actions and treatments are unsatisfactory to the Landscape Architect, then the Owner reserves the right to obtain an Owner's Arborist and crew as needed perform remedial actions and treatments and the Contractor will be fully liable for the cost of those actions and treatments at a cost determined by the Owner's Representative.
- D. Penalties and/or Liability: See above, and see Field Quality Control in Part 3 below.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Tree Protection Fencing: Fencing fixed in position and meeting the following requirements.
 - I. Chain-link Mesh Fabric Protection Fencing: Galvanized-steel mesh fabric fencing from minimum 2-inch opening, minimum 10-gauge wire chain-link fabric; with pipe posts, minimum 2-3/8-inch-OD line posts spaced at ten-foot maximum, 6-gauge aluminum wire ties, for a complete fence system. Include one three-foot wide gate at each enclosure if enclosure is not open-ended.
 - 2. Height of Fence: 6 feet
 - 3. An 8.5"x11" sign indicating the area as a tree protection zone shall be prominently displayed on each fence panel.
 - 4. Moveable fence panels may only be used upon written approval of the Owner's Representative.

PART 3 - EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion and sedimentation control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.
- C. Verification of Existing Conditions: Check plans and field situations, and if they do not match and work must occur closer to any existing tree(s) than planned, notify the Landscape Architect to evaluate and determine future viability of the existing tree(s) located within the area of construction or excavation. Coordinate final evaluation with the Landscape Architect to determine if the tree(s) should remain, be relocated, or be removed.
- D. Coordinate construction activities of Building Package with Site Package to prevent damage to trees, vegetation and roots within the protection zones to the full extent possible.

3.2 PROTECTION ZONES

- A. Tree Protection Fencing: Install tree protection fencing along edges of protection zones in a manner that will prevent people, equipment, and materials from easily entering protected area.
 - 1. Chain-link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
 - 2. Posts: Set or drive posts into ground a minimum of 24-inches without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to the Landscape Architect.
- B. Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Landscape Architect and Owner's Representative.
- C. Maintain tree protection fencing in good condition as acceptable by Landscape Architect, and remove when construction operations are complete and equipment has been removed from the site.
 - 1. If protective fencing is damaged, immediately execute the necessary repairs to re-establish the protective fencing to original configurations outline on the Tree Canopy/Tree Root Protection Plan.
- D. No removal or encroachment into tree protection enclosures shall be permitted unless approved in writing by the Landscape Architect.
- E. Notification: Notify the Landscape Architect when any overhanging branches or other plant material interferes with construction activity or pose potential risks to workers or bystanders.

- F. At the conclusion of the project, as tree protection fencing is being removed, continue to identify and enforce protection zones using temporary measures until final acceptance.
 - I. The use of these temporary protection methods is only acceptable for a period not to exceed five (5) business days.
- G. Access into Protection Zones: Only foot-traffic and manual wheelbarrows are allowed in Protection Zones, and that access is only allowed for landscaping and landscape maintenance, or for Building Package activities as indicated below.
 - I. Limited foot traffic access into Protection Zones for installation of building construction may be allowed only with the written permission of the Landscape Architect. If access is allowed, then first place $\frac{3}{4}$ " thick plywood protection board over four (4) inches of wood chips over woven geotextile on top of soil, without damaging trees and vegetation to remain. Temporarily tie up shrubs and canopies of trees as directed by Contractor's Arborist if required for access for building construction. Remove protection as soon as feasible.

3.3 EXCAVATION

- A. General: Excavate at edge of protection zone and for trenches indicated within protection zones according to requirements in Division 31 Section "Earth Moving".
- B. Trenching near Trees: Where utility trenches are required within protection zones, hand excavate under or around tree roots or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.
- C. Do not allow exposed roots to dry out before placing permanent backfill.
- D. Utilize hand equipment for clearing of brush, plants and sod, within and around protection zones.

3.4 ROOT PRUNING

- A. Any root pruning that may be required during the course of construction shall be supervised by the Contractor's Arborist.
- B. Prune roots that are affected by temporary and permanent construction. Prune roots as follows:
 - 1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant cut the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
 - 2. Temporarily support and protect roots from damage until they are permanently covered with soil.
 - 3. Cover exposed roots with burlap and water regularly.
 - 4. Backfill as soon as possible according to requirements in Division 31 Section "Earth Moving", Division 32 Section "Turf and Grasses", and Division 32 Section "Plants."
- C. Root Pruning at Edge of Protection Zones: Prune roots by cleanly cutting all roots to the depth of the required excavation.

- D. Root pruning within Protection Zones: Clear and excavate by hand to the depth of the required excavation to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.

3.5 CROWN PRUNING

- A. Any crown pruning that may be required during the course of construction shall be completed by the Contractor's Arborist.
- B. Prune branches that are affected by temporary and permanent construction. Prune branches as follows:
 - 1. Prune trees to remain to compensate for root loss caused by damaging or cutting root system. Provide subsequent maintenance during Contract period to ensure healthy plant growth.
 - 2. Pruning Standards: Prune trees according to ANSI A300 (Part1), newest edition.
- C. Remove and legally recycle pruned plant material.
- D. General: Follow requirements for work within and around Protection Zones including the following requirements.
 - 1. Trees to be removed that have branches extending into the canopy of trees to remain shall be removed under the continuous supervision of the Contractor's Arborist.
 - 2. Fell the trees to be removed so they fall away from protection zones and to avoid pulling and breaking of roots or branches of trees indicated to remain.

3.6 REGRADING

- A. Lowering Grade: Where finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.
- C. Minor Fill within Protection Zone: Where existing grade is 4 inches or less below elevation of finish grade, fill with topsoil. Place topsoil in a single uncompacted layer and hand grade to required finish elevations.

3.7 FIELD QUALITY CONTROL

- A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or be relocated that are damaged by construction operations, in a manner approved by the Landscape Architect.
 - 1. Have Contractor's Arborist perform the root cutting, branch pruning, and damage repair of trees and shrubs.
 - 2. Treat damaged trunks, limbs, and roots according to Arborist's written instructions.
 - 3. Perform repairs within 24 hours from when damage occurs.

4. The contractor shall be held liable for any damage to protected trees. A dollar value shall be determined by the Owner's Representative, or by Owner's certified tree appraiser following criteria outlined in the "Guide of Plant Appraisal" (Council of Tree and Landscape Appraisal, Latest Edition).
5. Replace vegetation that cannot be repaired and restored to full-growth status, as determined by the Landscape Architect.
 - a. If the contractual period and planting season do not allow replacement, then the Owner's Representative will determine a dollar value of the planting replacements and the Contractor will be liable for that value.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove excess excavated material, displaced trees, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 01 70 00 - EXECUTION AND CLOSEOUT REQUIREMENTS**PART 1 - GENERAL****1.1 SUMMARY**

- A. General: This Section specifies administrative requirements for execution and closeout requirements.

1.2 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected by governing authorities and/or agencies, and that Work is complete in compliance with Contract Documents and ready for inspection.
- B. Substantial Completion:
1. Work is not Substantially Complete unless following has been completed:
 - a. All Work, other than incidental corrective or punch list work, including appropriate cleaning.
 - b. Obtain applicable occupancy permits, pressure vessel permits, elevator permits, and similar approvals or certificates by Authorities Having Jurisdiction, assuring Contractor's and Owner's full access and use of completed Work.
 - c. Contractor's punch list of items to be completed or corrected and written request for inspection has been submitted to CM and Architect.
 - d. Complete final start-up and testing and commence instruction and training sessions on major systems including HVAC and controls, telephone and intercom, data communications, fire alarm, fire sprinkler, security, and clocks.
 - e. Make final changeover of locks and transmit new keys to Owner and advise Owner of changeover in security provisions.
 - f. Submit proof of required extended insurance coverages.
 - g. Designated systems and components are commissioned and usable.
 - h. Utilities are connected and operating normally.
 - i. As-Built Drawings, Operation and Maintenance Manuals, and Warranties have been submitted, reviewed and approved.
 - j. Asset Management Data has been submitted, reviewed and approved in accordance with this Specification, Specification 011200 Multiple Contract Summary and Exhibit C.
 - k. Work is accessible by normal vehicular and pedestrian traffic routes.
 2. Occupancy of Work by Owner does not indicate that Work is Substantially Complete or is acceptable in whole or in part.
 3. Issuance of Certificate of Substantial Completion does not indicate final acceptance of Project by Owner, and Contractor is not relieved of any responsibility for Project except those outlined by document.
 4. When Contractor considers Work, or designated portion thereof, is substantially complete, he/she shall submit to CM and Architect:

- a. Written notification Work, or designated portion thereof, is substantially complete
 - b. A list of items to be completed or corrected
5. Within a reasonable period of time after receipt of such notice, Architect will make an inspection to determine status of completion.
6. Should Architect determine that Work is not substantially complete:
 - a. Architect will promptly notify CM and Contractor in writing, giving reasons thereof.
 - b. Contractor shall remedy deficiencies in Work and send a second written notice to CM and Architect.
 - c. Architect will re-inspect Work.
7. When Architect, on basis of an inspection, determines that Work or designated portion thereof is Substantially Complete he/she shall prepare for submission to Contractor a list of items to be completed or corrected (aka Punchlist).
 - a. Contractor shall fully cooperate with such efforts to establish Punchlist.
 - b. Punchlist items shall be completed within 90 days after Date of Substantial Completion.
8. When Architect agrees that Work is substantially complete, he/she will:
 - a. Provide punch list to Construction Manager, who will attach it to their prepared Certificate of Substantial Completion, which shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
- C. Requirements Preparatory to Final Inspection:
 1. Punchlist items shall be completed.
 2. Temporary facilities and construction shall be removed from Site.
 3. Building and Site shall be thoroughly cleaned as specified herein.
 4. Systems and equipment shall function and operate as designed to meet specified requirements.
 5. Contractor's personnel or manufacturer's authorized representatives where applicable, shall have completed instruction for Owner's personnel in proper operation and maintenance of systems, equipment, and other portions of Project.
 6. Operational instructions for equipment shall be mounted and posted as needed.
 7. Electrical panels shall be properly labeled (typewritten), valves, pipes ducts, etc., properly marked and color-coded.
 8. Submittals; refer to Section 01 33 00 "Submittal Procedures".
 9. Forward certificates to CM and Architect with a letter requesting inspection.
- D. Final Inspection:
 1. After preparatory requirements have been completed, Contractor shall notify CM

and Architect so that final inspection can be performed.

- a. Contractor shall schedule final inspection in a sequential manner to facilitate inspection.
 2. CM and Architect shall perform inspection of Project within 7 days following receipt of certifications and notification.
 3. Should CM and Architect determine that Work is not complete for final inspection:
 - a. Contractor shall be promptly notified in writing, stating reasons.
 - b. Contractor shall immediately remedy deficiencies in Work and send a second written notice to CM and Architect.
 - c. CM and Architect will re-inspect Project within 7 days following receipt of notification.
 4. When CM and Architect concur that Project is finally complete, CM will request Contractor to make closeout submittals.
- E. Re-inspection Fees:
1. Architect will make only one (1) inspection each to determine Substantial Completion and Final Completion. If these inspections determine that work does not comply with claims of status by Contractor, either because of major items not completed or an excessive number of punch list items, successive inspections requested by Architect shall be charged to Contractor as follows.
 - a. Owner will compensate Architect for such additional services.
 - b. Owner will then deduct, by change order, amount of such compensation from Final Payment to Contractor.
- F. Final Payment:
1. Prior to approval of final request for payment, Contractor shall have completed following items and placed on file with CM:
 - a. Release of liens from subcontractors signed by each.
 - b. Written or printed operating instructions or manuals. This material shall not be submitted with shop drawings. When manuals or printed operating instructions for equipment are specified, they shall be delivered to CM.
 - c. Systems completely in operation with balancing completed in compliance with specifications.
 - d. Completion of punch list corrections or provided a value of uncompleted items.
 - e. Final requisition to list previous and additional change orders, requests of extras, previous requests for extension of time, etc.
 - f. Certification of final inspection from municipal agencies as needed.
- G. Submit Final Application for Payment in compliance with procedures and requirements stated in Contract.

1.3 FINAL CLEANING

- A. Condition of Premises and the Job Site: Maintain the premises and the job site in a reasonably neat and orderly condition and free from accumulations of waste materials and rubbish during the entire construction period. Remove crates, cartons and other flammable waste materials or

- trash from the Work areas each working day.
- B. Cleaning of Generally Unfinished Spaces: Elevator shafts, electrical closets, pipe and duct shafts, chases, furred spaces and similar spaces which are generally unfinished shall be cleaned and left free from rubbish, loose plaster, mortar drippings, extraneous construction materials, dirt and dust.
 - C. Chutes, Hoists and Receptacles: Remove rubbish by means of chutes, hoists or receptacles. Do not drop or throw rubbish or waste from one level to another within or outside the building.
 - D. Care of Finished Spaces: Care shall be taken by workmen not to mark, soil or otherwise deface finished surfaces. In the event that finished surfaces become defaced, clean and restore such surfaces to their original condition.
 - E. Schedule of Clean Up: Clean up immediately upon completion of each trade's work.
 - F. Cleaning of Areas to Be Painted and Finished: Clean areas in which painting and finishing work is to be performed just prior to the start of this work, and maintain these areas in a clean condition. Cleaning includes the removal of rubbish, broom cleaning of floors, the removal of any plaster, mortar, dust and other extraneous materials from finish surfaces, and surfaces that will remain visible after the Project work is complete. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Remove labels that are not permanent labels. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.
 - G. Preparation of Building for Occupancy: In addition to the cleaning specified above and the more specific cleaning which may be required in various sections of the Specifications, prepare the building for occupancy by a thorough cleaning, including washing (or cleaning by other appropriate methods) surfaces on which dirt or dust has collected and by washing glass on both sides. Wash exterior glass using a window cleaning contractor specializing in such work. Provide and maintain adequate runner strips of non-staining reinforced Kraft building paper on finished floors for protection. Leave equipment in an undamaged, bright, clean, polished condition. Re-cleaning will not be required after the Work has been accepted unless later operations of the Contract make re-cleaning necessary.
 - H. Cleaning of Site: Clean the site, including landscape development areas, of rubbish, litter and other foreign substances. Sweep paved areas broom clean; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.
 - I. Completion of the Work: Upon completion of the work, dismantle the temporary construction facilities and remove construction equipment, fences, scaffolding, surplus materials and rubbish of every kind from the site.
 - J. Compliance: Comply with regulations of authorities having jurisdiction and safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a legal manner.

1.4 ASSET MANAGEMENT DATA

- A. Owner has the goal to achieve day one operational readiness, using a computerized maintenance management system (CMMS) for work order management, preventive maintenance, space management, capital management, and other related functions. In

furtherance of the goal of day one operational readiness, the Developer (Skanska) aims to collect managed asset data in a structured format from the network of Contractors furnishing and installing said managed assets through their contractual relationship with Contractor.

- B. This Specification, along with Specification 011200 Multiple Contract Summary and Exhibit C, defines information deliverable requirements specific to the Procurement and Installation phases to be provided by Seller (suppliers/vendors), where direct procurement contracts between a Seller, Installing Subcontractor, and Contractor exist.
- C. Developer defines an in-scope managed asset that falls within the governance of the Asset Management Information Strategy, referred to as Managed Asset, as any installed item that physically resides within the systems and functional areas outlined in Exhibit C that:
 - 1. Requires routine maintenance or has a preventive maintenance schedule
 - 2. Has attributes a facility manager would need to reference in performing work order maintenance
 - 3. Is not consumable or otherwise replaced on a predetermined schedule
- D. Each unique managed asset will be categorized into a general functional grouping, referred to as Asset Type. Every unique asset will require one or more sets of attributes or meta-data, referred to as Asset Data, related to their asset type grouping. Exhibit C, Appendix A: Asset Type List, provides a matrix of the asset types that reside in each project specification section and the attribute sets required by the Seller or Subcontractor responsible for those specification sections at the various data drops described in Exhibit C, Table 4.1: Asset Data Drop Phases.
- E. All relevant asset attributes will be obtained iteratively during the phased data drops summarized in Exhibit C, Table 4.1: Asset Data Drop Phases.
- F. Representative examples of what Developer defines as managed assets are described in Exhibit C, Table 4.2. Table 4.2 is not all encompassing, but rather meant to serve as a reference to expand on the definition.
- G. **Note Professional Videography requirements in Exhibit C Appendix A: Asset Type List.**
- H. Contractors with managed assets in their work packages are required to provide asset data as it relates to the performance, properties, and characteristics of managed assets to satisfy their contractual obligations for the respective work package. Contractors with responsibility to furnish or install managed assets falling within the governance of the Asset Management Information Strategy, as defined in this document, shall perform the following tasks:
 - 1. Incorporate cost to furnish asset data as described by this exhibit into their bid. Bidder may be asked to break out this cost in their bid sheet.
 - 2. Within 15 days of bid submission, Contractor shall provide contact information for the representative of their firm with whom the Asset Management Data Integrator will coordinate asset data expectations and deliverables upon Subcontract award.
 - 3. Coordinate all required activities to submit asset data through the designated Asset Management Data Integrator.
 - 4. Attend through conference call, web meeting, or in-person meeting, a post-award briefing with the Asset Management Data Integrator to review Contractor expectations for completion and submission of required asset data.
 - 5. Use the Developer-provided spreadsheet template or similar electronic form to

capture required asset data, completely and accurately.

6. Follow any direction given by Asset Management Data Integrator to provide completed asset data with regard to specific units, format, nomenclature, or other data or naming standards as required.
7. Use the submittals systems and procedures as prescribed in specification Section 013300 Submittal Procedures and confirmed by the Asset Management Data Integrator in the post-award briefing.
8. In addition to these required tasks, Contractors may also expect that:
9. Developer will provide Contractors documentation, instructions, and on-call help to assist in completing asset data forms through the Asset Management Data Integrator or other designated representatives of Developer.
10. Developer does not expect that any one asset will require in excess of 40 attributes and considers 20 minutes per managed asset a reasonable estimate of time to complete asset data requirements.

1.5 OPERATING AND MAINTENANCE DOCUMENTATION

- A. Manuals: Under the direction of the Contractor, each subcontractor shall furnish operation and maintenance instruction manuals. The manuals shall contain the manufacturers' instructions for each item of equipment and apparatus furnished under the Contract, together with any additional data as may be required by the various sections of the Specifications. Furnish manufacturer's original brochures.
 1. Provide Operating and Maintenance Documentation in electronic PDF form to the Architect and CMA. Assemble each manual into a composite electronically indexed file.
 2. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 3. Printed O&M binders are not required. Owner shall access Operation and Maintenance information via digitally catalogued PDF files, organized in accordance with Section 1.6 Organization herein.
- B. Endorsement: By submission of manuals, the Contractor acknowledges, that each of the manuals is complete and accurate.
- C. Submittal of Manuals: Prior to the Contractor's applications for final payment, and as a condition to approval of the applications, each subcontractor shall deliver to the Contractor the manuals arranged in proper order, indexed, and endorsed. Assemble the manuals for all divisions of the Work, review them for completeness, and submit them to the CMA. If hardcopy format is required by Owner, deliver the manuals in suitable transfer cases indexed and marked for each division of the Work

1.6 ORGANIZATION

- A. Contents
 1. Prepare a table of contents for each volume, with each product or system description identified.

- B. Part 1 - Directory
 - 1. List names, addresses, and telephone numbers of Architect, CM and Contractors.
 - 2. List subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service, including nights, weekends, and holidays.
- C. Part 2 – Asset Management Data
- D. Part 3 - Operation and Maintenance Instructions
 - 1. Arrange instructions by system and subdivide by specification section.
 - 2. Identify following for each category:
 - a. List of equipment
 - b. Parts list for each asset
 - c. Startup and operating procedures
 - d. Maintenance procedures for equipment and systems
 - e. Maintenance instructions for finishes, including recommended cleaning methods and materials, and special precautions and detrimental agents
 - f. Names, addresses, and telephones of subcontractors and suppliers
- E. Part 4 - Project documents and certificates
 - 1. Shop drawings and product data
 - 2. Startup reports
 - 3. Test and balance reports
 - 4. Commissioning reports
 - 5. Spare parts list
 - 6. Training materials
 - 7. Certificates
 - 8. Photocopies of warranties and bonds

1.7 OPERATING INSTRUCTIONS

- A. Operating instructions shall be divided into four subsections as follows:
 - 1. Start-up - Give complete instructions for energizing equipment and making initial settings and adjustments whenever applicable. If equipment is fully automatic, a statement to that effect shall be all that is needed. If a specific sequence or steps shall be performed, give step-by-step instructions in proper sequence. If timing (such as warm-up between power-on and adjustment) is important, clearly state specific minimum time needed at proper point in procedure. Refer to controls and indicators by panel; make references consistent with nomenclature used in illustrations and tables of controls and indicators. If preliminary settings differ from different modes of operations, give procedures for each mode.

2. Operation - Give detailed instruction in proper sequence for each mode of operation. When, for a given action on part of operator, alternate equipment responses are possible, give appropriate operation reaction to each.
3. Emergency Operation - If some functions of equipment can be operated while other functions are disabled, give instructions for operations under these conditions. Include here only those alternate methods from operation (from normal) that operator can follow when there is a partial failure or malfunctioning of components, or other unusual condition.
4. Shutdown - Include instructions for stopping and securing equipment after operation. If a particular sequence is needed, give step-by-step instructions in that order.

1.8 MAINTENANCE INSTRUCTIONS

A. Maintenance instructions shall be divided into two subsections as follows:

1. Preventive Maintenance - Provide a schedule for preventive maintenance. State, preferably in tabular form, recommended frequency of performance for each preventive task (cleaning, inspection, and scheduled overhaul).
 - a. Provide instruction and schedules for routine cleaning and inspection, with recommended lubricants where applicable.
 - b. If periodic inspection of equipment is needed for operation, cleaning, or other reasons, indicate items to be inspected and give inspection criteria for, but not limited to motors, controls filters, heat exchangers, etc.
 - c. Provide instruction for minor repairs or adjustments needed for preventive maintenance routines. Minor repairs and adjustments shall be limited to repairs and adjustments that may be performed without special tools or test equipment, and that require no special training or skills. Identify test points and give values for each.
2. Corrective Maintenance - Provide instructions predicated upon a logical effect-to-cause trouble-shooting philosophy to minimize equipment down time. Instructions and data shall appear in normal sequence of corrective maintenance, for example, troubleshooting first, repair and replacement of parts second, and then parts list.
 - a. Trouble-shooting - shall describe general procedure for locating malfunctions and shall give, in detail, any specific remedial procedures or techniques. Data shown is intended to isolate only most common equipment deficiencies. Trouble-shooting tables, charts, or diagrams may be used to present specific procedures. A guide to this type shall be a three column chart. Columns shall be entitled Malfunction, Probable Cause, and Recommended Action. Information shall be alphabetically arranged by component, and each component shall, in turn, list deficiencies that may be expected. Each deficiency shall contain one or more problems with a recommended correction.
 - b. Repair and Replacement - Indicate procedures most likely to be needed in maintenance of systems and equipment. Information included here shall consist of step-by-step instructions for repair and replacement of defective items. Include all information needed to accomplish repair and replacement, including information such as torque values. Identify tools, special equipment, and materials that may be needed. Identify uses for maintenance equipment. Paragraphs shall contain headings to identify topics covered.

- c. Safety Precautions - shall comprise a listing of safety precautions and instructions to be followed before, during, and after repairs or adjustments are made or routine maintenance is performed.
- B. Spare Parts Lists:
 - 1. Include recommended spare parts for equipment furnished for Project. List shall include a tabulation of descriptive data for all electrical electronic spare parts and all mechanical spare parts for each type of equipment or system. Each part shall be properly identified by part number and manufacturer.

1.9 Submission Requirements

- A. For Final Inspection: Submit one digital copy of completed volumes in final form 15 days prior to final inspection. This copy will be returned with Architect's comments. Revise content of documents as needed prior to final submittal.
- B. Submit final volumes revised, in PDF and if requested, as hardcopies, within 10 days following final inspection.
- C. PDF Format: PDF format for Operation and Maintenance Manuals shall be organized using the same method as the hard copy manuals. Parts and specifications sections shall be bookmarked and have searchable functionality.
- D. Verify with Owner for additional PDF File organization.

1.10 OPERATING AND MAINTENANCE TRAINING AND INSTRUCTIONS

- A. Items in Detailed Review: Arrange for each installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
 - 1. Maintenance manuals.
 - 2. Record documents.
 - 3. Spare parts and materials.
 - 4. Tools.
 - 5. Lubricants.
 - 6. Fuels.
 - 7. Identification systems.
 - 8. Control sequences.
 - 9. Hazards.
 - 10. Cleaning.
 - 11. Warranties and bonds.

12. Maintenance agreements and similar continuing commitments.
- B. Demonstration of Procedures: As part of instruction for operating equipment, demonstrate the following procedures:
1. Start-up.
 2. Shutdown.
 3. Emergency operations.
 4. Noise and vibration adjustments.
 5. Safety procedures.
 6. Economy and efficiency adjustments.
 7. Effective energy utilization.
- C. Video Recordings: Videography documenting equipment startup, inspections and/or training shall adhere to the following requirements:
1. Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
 2. At beginning of each training module, record each chart containing learning objective and lesson outline.
 3. Provide high quality color video recordings with menu navigation in format acceptable to Professional.
 4. Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
 5. Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.
 6. Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.
 7. Provide video recordings used as a component of training modules in same format as recordings of live training.

1.11 PROJECT RECORD DOCUMENTS

- A. Contractual Requirements: Refer to General Conditions, for contractual requirements governing record documents.
- B. Record Set: Make a complete and accurate record of the changes or deviations from the Contract Documents and shop drawings, indicating the Work as actually installed. The Contractor, and the subcontractor for each part of the Work, shall record the changes under the direction of the Contractor as the Work progresses. Neatly and correctly mark such changes on blackline prints of the Drawings affected, or on a copy of the Specifications, together with

appropriate supplementary notes. Arrange the record Drawings in proper order and index the shop drawing information in accordance with the various sections of the Specifications. Keep the record set of Drawings, shop drawings and Specifications at the job site for review by the Architect or Owner.

1. Provide version of record set drawings in PDF format, indexed by discipline, and drawings series within each discipline.
- C. Endorsement: At the completion of the Work the Contractor acknowledges, that each of the revised prints of the Drawings and Specifications constitutes a complete and accurate record of the Work as installed or constructed.
- D. Record of Changes or Deviations from the Contract Documents and the shop drawings: As the work progresses keep a complete and accurate record of changes or deviations from the Contract Documents and the shop drawings, indicating the Work as installed. Show changes neatly and correctly on the affected document using black line prints of the Drawings or the Specifications, with appropriate supplementary notes. Keep this record set of Drawings, shop drawings and Specifications at the job site available to the Architect and Owner.
- E. Delivery of the Record Documents: Prior to application for final payment, and as a condition to its acceptance by the Architect and Owner, deliver the record documents in proper order. Deliver the records digitally or in suitable transfer cases, indexed and marked, for each Division of the Work.
- F. Responsibility of the Contractor: Acceptance of such records by the Architect or Owner shall not be a waiver of any deviation from the Contract Documents or the shop drawings or in any way relieve the Contractor from his responsibility to perform the Work in accordance with the Contract Documents and the shop drawings to the extent they are in accordance with the Contract Documents.
- G. Sustainable Building Manual: The Contractor shall compile a Sustainable Building Manual of items required in Section 01 81 13 "Sustainable Design Requirements", in a loose-leaf binder with tabs for each section of the specifications which has such a requirement. Provide subdivided tabs by the specific requirement (Low Emitting Materials, Recycled Content, Certified Wood). The Contractor shall include each product data, manufacturer's specifications and installation requirements, certifications and other data which specifically address each product's compliance with specified requirements. The Contractor shall maintain 3 copies of this binder. One on site for the Contractor's use, one with the Owner's Environmental Consultant, and the final one to be submitted to the Owner at Project Completion.

1.12 WARRANTIES AND GUARANTEES

- A. Terms of the Contractor's Special Warranties and Guarantees: Refer to the General Conditions for terms of the Contractor's special warranties and guarantees of workmanship and materials.
 1. Warranties and guarantees required by the Technical Sections of the Specifications shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and are in addition to and run concurrent with other warranties and guarantees made by the Contractor under requirements of the Contract Documents.
- B. Definitions
 1. Standard Product Warranties and/or Guarantees are preprinted written documents published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.

2. Special Warranties and/or Guarantees are written documents required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties and/or guarantees or to provide greater rights for the Owner. When a special warranty and/or guarantee is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for Owner's approval prior to final execution.
- C. Submission Requirements
1. Submit documents to Owner and Architect within 10 days following Date of Substantial Completion. For item accepted after Date of Substantial Completion, submit documents within 10 days following each individual acceptance.
 - a. When a designated portion of Work is completed and occupied or used by Owner, by separate agreement with Contractor during construction period, submit properly executed warranties to Owner within 15 days of completion of that designated portion of Work.
 2. When special warranty is required to be executed by Contractor, or Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by required parties. Submit a draft to Owner.
 - a. Contractors are required to fulfill the warranty requirements per the specification. All warranties start at the date of substantial completion.

MCNPL PERMIT BID SET - PHASE 2			
SPECIAL WARRANTIES PER SPEC*			
Required Warranty Term Known			
Spec Section # - Title	Para	Description	Years
08 14 16-FLUSH WOOD DOORS	1.9-A	Flush Wood Doors - Solid-Core Interior Doors	Life of Installation
03 30 00-CAST IN PLACE CONCRETE	1.10-A	Sheet vapor retarder/termite barrier material and accessories	10
07 42 29-TERRA COTTA	1.10-A	Terra Cotta Panels	10
07 42 33-EXTERIOR SOLID PHENOLIC PANEL	1.11-A	Exterior Solid Phenolic Panel	10
07 46 46-FIBER CEMENT PANELS	1.8-A	Fiber Cement Panels	10
07 71 00-ROOF SPECIALTIES	1.11-B	Painted Finishes	20
07 71 29-MANUFACTURED ROOF EXPANSION JOINTS	1.6-B	Painted Finishes	20

07 72 73-VEGETATED ROOF SYSTEMS	1.10-B	Plant Growth - Ground Covers, Perennials, Vines, and Ornamental Grasses	2
07 72 73-VEGETATED ROOF SYSTEMS	1.10-A	Vegetated Roof Assembly	5
08 14 16-FLUSH WOOD DOORS	1.9-A	Flush Wood Doors - Solid-Core Exterior Doors	5
08 14 16-FLUSH WOOD DOORS	1.9-A	Flush Wood Doors - Hollow-Core Interior Doors	2
08 80 00-GLAZING	1.9-B	Coated-Glass Products	10
08 80 00-GLAZING	1.9-D	Insulating Glass	10
08 91 19-FIXED LOUVERS	1.7-A	Fixed Louvers- Factory-Applied Finishes	20
08 91 19-FIXED LOUVERS	1.7-B	Fixed Louvers - Anodized Finishes	10
09 30 13-CERAMIC TILING	1.11-A	Ceramic Tile	20
09 68 13-TILE CARPETING	1.6-B	Carpet Tile	10
10 22 26-OPERABLE PARTITION	1.7-B	Operable Partition(s)	10
10 44 16-FIRE EXTINGUISHERS	1.7-A	Fire Extinguishers	6
10 14 19-DIMENSIONAL LETTER SIGNAGE	1.11-A	Dimensional Letter Signage	5
10 14 23.16-ROOM-IDENTIFICATION PANEL SIGNAGE	1.12-A	Room Identification Panel Signage	5
12 24 13-ROLLER WINDOW SHADES	1.12-A	Motorized Components	5
08 15 00-INTEGRATED ACCESS CONTROL DOOR	1.7-F	Access Control Software - Upgrades & Fixes	2
08 15 00-INTEGRATED ACCESS CONTROL DOOR	1.7-F	Access Control Software - Major software revisions	1
12 24 13-ROLLER WINDOW SHADES	1.12-A	Roller Window Shades	10
12 24 13-ROLLER WINDOW SHADES	1.12-A	Fabric	10
14 24 00 - HYDRAULIC ELEVATORS	1.11A	SEE SPECIFICATION	5
22 33 00 - DOMESTIC WATER HEATERS	1.06A/B	SEE SPECIFICATION	5-10
23 74 16.15 PACKAGED DX / GAS RTU	M3.1	Compressors	5
23 81 27 SPLIT SYSTEM HEAT PUMPS	1.06A	Compressors	5
26 09 00 LIGHTING CONTROLS	1.06A	SEE SPECIFICATION	2

32 93 00 PLANTS	1.11A	SEE SPECIFICATION	1+1	
* VERIFY SPECIFICATIONS FOR OTHER SPECIAL WARRANTIES				

D. Organization

1. Compile specified warranties and service and maintenance agreements. Execute and assemble documents from subcontractors, suppliers, and manufacturers.
2. Prepare a table of contents, in an orderly sequence, with information as follows:
 - a. Product or assembly
 - b. Firm, with name of principal, address, and telephone number
 - c. Scope
 - d. Date of beginning and duration of warranty, bond, or service agreement
 - e. Provide information for proper procedure to be followed in case of failure, and in instances that may affect validity of warranty.

1.13 WARRANTY REQUIREMENTS

- A. Written warranties made to Owner are in addition to implied warranties and shall not limit duties, obligations, right and remedies otherwise available under law, nor shall warranty periods be interpreted as limitations on time in which Owner can enforce such other duties, obligations, rights, or remedies.
- B. Manufacturer's disclaimers and limitations on product warranties shall not relieve Contractor of warranty on Work that incorporates products, nor shall it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with Contractor.
- C. **Warranties shall become valid and operative upon issuance of Certificate of Substantial Completion.**
- D. For items of Work delayed beyond Date of Substantial Completion, provide an updated schedule within 10 days after acceptance, listing date of acceptance as start of warranty.
- E. Related Damages and Losses:
 1. When correcting warranted and/or guaranteed Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted and/or guaranteed Work.
- F. Reinstatement of Warranty and/or Guarantee
 1. When Work covered by a warranty and/or guarantee has failed and been corrected by replacement or rebuilding, reinstate the warranty and/or guarantee by written endorsement. The reinstated warranty and/or guarantee shall be equal to the original warranty and/or guarantee with an equitable adjustment for depreciation.
- G. Replacement Cost

1. Upon determination that Work covered by a warranty and/or guarantee has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents.
 2. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
- H. Owner's Recourse: Written warranties and/or guarantees made to the Owner are in addition to implied warranties and/or guarantees, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty and/or guarantee periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
1. Rejection of Warranties and/or Guarantees: The Owner reserves the right to reject warranties and/or guarantees and to limit selections to products with warranties and/or guarantees not in conflict with requirements of the Contract Documents.
- I. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, guarantee, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
- J. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties and/or guarantees do not relieve the Contractor of the warranty and/or guarantee on the Work that incorporates the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties and/or guarantees with the Contractor.
- K. Documents to be Provided to the Owner Prior to Final Payment: Prior to final payment and before the issuance of a final Certificate for Payment, in accordance with the provisions of the General Conditions, provide the following documents directly to the Owner:
1. Warranties and/or Guarantees: The warranties and/or guarantees required by the General Conditions and any other extended warranties and/or guarantees stated in the technical Sections of the Specifications.
 2. Release or Waiver of Liens: As required by the General Conditions.
 3. Service and Maintenance Contracts: Furnish properly executed contracts for any extended service or maintenance as required by the technical sections of the Specifications.

1.14 CERTIFICATE OF OCCUPANCY

- A. Filing of Documents with the Architect for Transmittal to the Owner: Prior to final payment and before the issuance of a final Certificate for Payment, in accordance with the provisions of the General Conditions, file the following documents with the Architect for transmittal to the Owner:
- B. Certificate of Occupancy: Where the local law at the site of the building requires either a temporary and/or permanent Certificate of Occupancy, obtain and pay for these certificates and deliver to the Architect.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

SECTION 02 41 16 - STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Demolition and removal of buildings or structures.
2. Demolition and removal of site improvements.
3. Abandoning in-place below-grade construction.
4. Removing below-grade construction.
5. Disconnecting, capping or sealing, and abandoning in-place site utilities.
6. Disconnecting, capping or sealing, and removing site utilities.
7. Salvaging items for reuse by Owner.

B. Related Requirements:

1. Section 011000 "Summary" for use of the premises and phasing requirements.
2. Section 013200 "Construction Progress Documentation" for preconstruction photographs taken before building demolition.
3. Section 024119 "Selective Demolition" for partial demolition of buildings, structures, and site improvements.
4. Section 311000 "Site Clearing" for site clearing and removal of above- and below-grade site improvements that are not part of building demolition.

1.2 DEFINITIONS

- A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.
- B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner as indicated. Include fasteners or brackets needed for reattachment elsewhere.

1.3 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 COORDINATION

- A. Arrange demolition schedule so as not to interfere with [Owner's on-site operations][or][operations of adjacent occupied buildings].

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at [Project site]<Insert location>.
 - 1. Inspect and discuss condition of construction to be demolished.
 - 2. Review structural load limitations of existing structures.
 - 3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review and finalize protection requirements.
 - 5. Review procedures for [noise control][and][dust control].
 - 6. Review procedures for protection of adjacent buildings.
 - 7. Review storage, protection, and accounting for items to be salvaged and returned to Owner.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For [refrigerant recovery technician][specialty demolition contractor].
- B. Engineering Survey: Submit engineering survey of condition of building.
- C. Survey of Existing Conditions: Submit survey.
- D. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property[, for environmental protection][, for dust control][and][, for noise control]. Indicate proposed locations and construction of barriers.
 - 1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain[including means of egress from those buildings].
- E. Schedule of Building Demolition Activities: Indicate the following:
 - 1. Detailed sequence of demolition work, with starting and ending dates for each activity.
 - 2. Temporary interruption of utility services. Indicate how long services will be interrupted.
 - 3. Coordination for shutoff and capping[or re-routing] of utility services.
- F. 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 in accordance with EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: [Type I][Type II][Type III][Universal] certified by an EPA-approved certification program.
- B. Specialty Demolition Contractor Qualifications: A competent person [licensed by the authority having jurisdiction,]who has training, knowledge, or experience in the use of each type of blasting method used and in the field of transporting, storing, handling, and using explosives; and has a working knowledge of state and local laws and regulations pertaining to explosives.

1.9 FIELD CONDITIONS

- A. Buildings to be demolished will be vacated and their use discontinued before start of the Work.
- B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.
 - 1. Provide not less than [72]<Insert number> hours' notice of activities that will affect operations of adjacent occupied buildings.
 - 2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.
 - a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.
- C. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - 1. Before building demolition, Owner will remove the following items:
 - a. <Insert items to be removed by Owner>.
- D. Hazardous Materials:
 - 1. It is not expected that hazardous materials will be encountered in the Work.
 - a. Hazardous materials will be removed by Owner before start of the Work.
 - b. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
 - 2. Hazardous materials are present in buildings and structures to be demolished. A report on the presence of hazardous materials is [on file][included in Section

003126 "Existing Hazardous Material Information"] for review and use. Examine report to become aware of locations where hazardous materials are present.

- a. Hazardous material remediation is specified in Section <Insert Section number> "<Insert Section title>."
 - b. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified in Section <Insert Section number> "<Insert Section title>."
 - c. Owner will provide material safety data sheets for hazardous materials that are known to be present in buildings and structures to be demolished because of building operations or processes performed there.
- E. On-site sale of removed items or materials is not permitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 SOIL MATERIALS

- A. Satisfactory Soils: Comply with requirements in Section 312000 "Earth Moving."

PART 3 - EXECUTION

3.1 DEMOLITION CONTRACTOR

- A. Specialty Demolition Contractor:
 - 1. <Insert, in separate subparagraphs, name of Contractor prequalified to perform the Work of this Section>.

3.2 EXAMINATION

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

- C. [Perform][Engage a professional engineer to perform] an engineering survey of 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 building demolition operations.
- D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.
- E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or video[, measured drawings][and][templates]. Comply with Section 013233 "Photographic Documentation."
 - 1. Inventory and record the condition of items to be removed and salvaged. Photograph or video conditions that might be misconstrued as damage caused by removal.
 - 2. Photograph or video existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by demolition operations or removal of items for salvage.

3.3 PREPARATION

- A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.
- B. Temporary Shoring: Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent unexpected movement or collapse of construction being demolished.
 - 1. Strengthen or add new supports when required during progress of demolition.
- C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 015000 "Temporary Facilities and Controls."
 - 1. Protect adjacent buildings and facilities from damage due to demolition activities.
 - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
 - 3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
 - 4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
 - 6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
 - 7. Erect and maintain dustproof partitions and temporary enclosures to limit dust,

noise, and dirt migration to occupied portions of adjacent buildings.

- D. Existing Utilities to Remain: Maintain utility services to remain and protect against damage during demolition operations.
 - 1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
 - 2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.
 - a. Provide at least [72]<Insert number> hours' notice to occupants of affected buildings if shutdown of service is required during changeover.
- E. Existing Utilities to Be Disconnected: Locate, identify, disconnect, and seal or cap off utilities serving buildings and structures to be demolished.
 - 1. Owner will arrange to shut off utilities when requested by Contractor.
 - 2. Arrange to shut off utilities with utility companies.
 - 3. If disconnection of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
 - 4. Cut off pipe or conduit a minimum of [24 inches]<Insert depth> below grade at or outside the building or structure to be demolished and cap, valve, or plug and seal remaining portion of pipe or conduit [after bypassing]in accordance with requirements of authorities having jurisdiction.
 - 5. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing by authorities having jurisdiction.
- F. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment in accordance with 40 CFR 82 and regulations of authorities having jurisdiction.

3.4 SALVAGE

- A. Items to be removed and salvaged are indicated[on Drawings.][below:]
 - 1. Doors and door hardware.
 - 2. Windows.
 - 3. Cabinets.
 - 4. Mirrors.
 - 5. Tackboards.
 - 6. White boards.
 - 7. Plumbing fixtures.
 - 8. <Insert items to be salvaged>.
- B. Comply with the following for salvaged items:
 - 1. Clean salvaged items of dirt and demolition debris.
 - 2. Pack or crate items after cleaning. Identify contents of containers with label indicating elements, date of removal, quantity, and location where removed.
 - 3. Store items in a secure area until delivery to Owner.

4. Transport items to storage area [designated by Owner][indicated on Drawings].
5. Protect items from damage during transport and storage.

3.5 DEMOLITION, GENERAL

- A. General: Demolish indicated buildings[and site improvements] completely. Use methods required to complete the Work within limitations of governing regulations and as follows:
 1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
 2. Maintain fire watch during and for at least <Insert number> hours after flame-cutting operations.
 3. Maintain adequate ventilation when using cutting torches.
 4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- B. Site Access and Temporary Controls: Conduct building demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed trafficways if required by authorities having jurisdiction.
 2. Use water mist and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations. Do not use water when it may damage adjacent construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
- C. Explosives: Use of explosives is not permitted.

3.6 DEMOLITION BY EXPLOSIVES

- A. Explosives: Perform explosive demolition operations in accordance with ANSI/ASSP A10.7 and regulations of authorities having jurisdiction.
 1. Obtain written permission from authorities having jurisdiction before bringing explosives to, or using explosives on, Project site.
 2. Do not damage adjacent structures, property, or site improvements when using explosives.
- B. Comply with recommendation in specialty explosives consultant's report.

3.7 DEMOLITION BY MECHANICAL MEANS

- A. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before

disturbing supporting members on the next lower level.

- B. Remove debris from elevated portions of the building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

1. Remove structural framing members and lower to ground by method suitable to minimize ground impact and dust generation.

- C. Below-Grade Construction:

1. Abandon foundation systems and other below-grade construction. Cut below-grade construction flush with grade.
2. Demolish foundation systems and other below-grade construction that are within footprint of new construction and extending [5 ft.]<Insert dimension> outside footprint indicated for new construction. Abandon below-grade construction outside this area.
 - a. Remove below-grade construction, including basements, foundation systems, and footings, [completely][to at least 6 inches below grade][to at least 12 inches below grade][to depths indicated].
3. Demolish foundation systems and other below-grade construction.
 - a. Remove below-grade construction, including basements, foundation systems, and footings, [completely][to at least 6 inches below grade][to at least 12 inches below grade][to depths indicated].

- D. Existing Utilities:

1. Abandon existing utilities and below-grade utility structures. Cut utilities flush with grade.
2. Demolish existing utilities and below-grade utility structures that are within [5 ft.]<Insert dimension> outside footprint indicated for new construction. Abandon utilities outside this area.
 - a. Fill abandoned utility structures with [satisfactory soil materials][recycled pulverized concrete] in accordance with backfill requirements in Section 312000 "Earth Moving."
3. Demolish and remove existing utilities and below-grade utility structures.

- E. Hydraulic Elevator Systems: Demolish and remove elevator system, including cylinder, plunger, well assembly, steel well casing and liner, oil supply lines, and tanks.

3.8 SITE RESTORATION

- A. Below-Grade Areas:

1. Rough grade below-grade areas ready for further excavation or new construction.
2. Completely fill below-grade areas and voids resulting from building demolition

operations with [satisfactory soil materials][recycled pulverized concrete][recycled pulverized masonry] in accordance with backfill requirements in Section 312000 "Earth Moving."

- B. Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes. Provide a smooth transition between adjacent existing grades and new grades.

3.9 REPAIRS

- A. Promptly repair damage to adjacent buildings caused by demolition operations.

3.10 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site [and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.][and recycle or dispose of them in accordance with Section 017419 "Construction Waste Management and Disposal."]

- 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

- B. Do not burn demolished materials.

3.11 CLEANING

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

- 1. Clean roadways of debris caused by debris transport.

END OF SECTION 02 41 16

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

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

- B. Related Requirements:

- 1. Section 01-1000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 2. Section 01-7300 "Execution" for cutting and patching procedures.
 - 3. Section 31-1000 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of each Prime Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.
6. Owner, Architect, MEP Engineer and Structural Engineer must attend.
7. Review requirements to maintain Phase II area in operation during demolition and renovation.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For refrigerant recovery technician.

- B. Schedule of Selective Demolition Activities: Indicate the following:

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

- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

- D. Predemolition Photographs or Video: Submit before Work begins.

- E. 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.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.

- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 QUALITY ASSURANCE

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

1.9 FIELD 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.
 - 1. Before selective demolition, Owner will remove the following items:
 - a. All hazardous materials.
 - b. All fixtures and furnishings that the Owner desires to retain. Anything that remains in the building, other than identified herein, will be demolished.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition. No additional fee will allowed for replacement of items not required to be demolished or for items not demolished that are required to be demolished later.
- D. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
 - 1. Hazardous materials will be removed by the Owner's vendor prior to the start of demolition.
 - 2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents. Owner's vendor will remove any additional hazardous materials encountered.
- 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record or architectural documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required. Any accidental demolition of items intended to remain will be replaced by the GC at no additional cost to the project.
- 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.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 01-1000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Each Prime Contractor is responsible for the existing systems of their trade. 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, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- C. Refrigerant: Mechanical Contractor is responsible to remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

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 Section 01-5000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
 - 3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 - 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 - 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 01-5000 "Temporary Facilities and Controls."

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Each Prime Contractor is responsible to demolish and remove existing construction of their trade only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches 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.
 - 5. Maintain adequate ventilation when using cutting torches.
 - 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 9. Dispose of demolished items and materials promptly. Comply with requirements in Section 01-7419 "Construction Waste Management and Disposal."

10. Holes or openings created by the removal of ductwork, louvers, piping, conduit, etc in existing walls and floors to remain will be closed and patched as required by the General Contractor.
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.
 1. Building Structure and Shell: 75 percent.
- C. Removed and Salvaged Items:
 1. Clean salvaged items.
 2. Transport items to Owner's storage area on-site.
 3. Protect items from damage during transport and storage.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least **3/4 inch (19 mm)** at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.
- C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- F. Salvage existing brick for reuse in areas indicated on drawings and for brick repairs that may be required. Provide Owner with 2 pallets of existing brick for future use.

3.6 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, each Prime Contractor is responsible to remove the demolished materials of their trade from Project site and legally dispose of them in an EPA-approved landfill.
 1. Do not allow demolished materials to accumulate on-site.
 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

4. Comply with requirements specified in Section 017419 "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.

3.7 CLEANING

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

END OF SECTION 02 41 19

SECTION 03 10 00 - CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Form-facing materials.
 - 2. Waterstops.
- B. Related Requirements:
 - 1. Section 32-1313 "Concrete Paving" for formwork related to concrete pavement and walks.

1.2 DEFINITIONS

- A. Form-Facing Material: The temporary form materials that come in direct contact with the concrete as part of the formwork components in supporting the concrete while the concrete is setting and gaining sufficient strength to be self-supporting. The most common materials are steel, aluminum, and wood.
- B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction, movement, contraction, and isolation joints
 - c. Forms and form-removal limitations.
 - d. Shoring and reshoring procedures.
 - e. Anchor rod and anchorage device installation tolerances.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Prepared by, and signed and sealed by, a qualified professional engineer responsible for their preparation, detailing fabrication, assembly, and support of forms.

1. For exposed vertical concrete walls, indicate dimensions and form tie locations.
2. Indicate dimension and locations of construction and movement joints required to construct the structure in accordance with ACI 301.
 - a. Location of construction joints is subject to approval of Architect.
3. Indicate location of waterstops.
4. Indicate proposed schedule and sequence of stripping of forms, shoring removal, and reshoring installation and removal.
5. Indicate layout of insulating concrete forms, dimensions, course heights, form types, and details.

C. Samples:

1. For waterstops.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Minutes of preinstallation conference.
- C. Qualification Statements: For testing and inspection agency.

1.6 QUALITY ASSURANCE

- A. Testing and Inspection Agency Qualifications: An independent agency, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Mockups: Formed surfaces to demonstrate typical joints, surface finish, texture, tolerances, and standard of workmanship.
 1. Build panel approximately 100 sq. ft. in the location indicated or, if not indicated, as directed by Architect.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and

construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.
 - a. For architectural concrete specified in Section 03-3300 "Architectural Concrete," limit deflection of form-facing material, studs, and walers to 0.0025 times their respective clear spans (L/400).

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03-3000 "Cast-in-Place Concrete, and as follows:
 - a. Plywood, metal, or other approved panel materials.
 - b. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - 1) APA HDO (high-density overlay).
 - 2) APA MDO (medium-density overlay); mill-release agent treated and edge sealed.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. 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 produce surfaces without spiral or vertical seams not exceeding specified formwork surface class.

1. Provide forms with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

2.3 WATERSTOPS

A. Flexible PVC Waterstops: U.S. Army Corps of Engineers' CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints, with factory-fabricated corners, intersections, and directional changes.

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. BoMetals, Inc.
 - b. Sika Corporation

- c. Vinylex Waterstop & Accessories
- 2. Profile: Flat dumbbell with center bulb.
 - 3. Dimensions: 6 by 3/8 inch thick; nontapered.
- B. Self-Expanding Butyl Strip Waterstops: Manufactured rectangular or trapezoidal strip, butyl rubber with sodium bentonite or other hydrophilic polymers, for adhesive bonding to concrete, 3/4 by 1 inch.
 - 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 Coatings & Waterproofing Inc
 - b. CETCO is a subsidiary of Minerals Technologies Inc.
 - c. Concrete Sealants Inc.
 - d. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands)
 - e. Sika Corporation

2.4 RELATED MATERIALS

- A. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- B. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.
- D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
 - 2. Form release agent for form liners to be acceptable to form liner manufacturer.
- E. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, 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.
- F. Sealant: One-part moisture cure silicone sealant used with form liners.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

- A. Comply with ACI 301.
- B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 033000 "Cast-in-Place Concrete" for as-cast finishes.
- C. Limit concrete surface irregularities as follows:
 - 1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.
- D. Construct forms tight enough to prevent loss of concrete mortar.
 - 1. Minimize joints.
 - 2. Exposed Concrete: Symmetrically align joints in forms.
- E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.
 - 1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
 - 2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 3. Install keyways, reglets, recesses, and other accessories, for easy removal.
- F. Do not use rust-stained, steel, form-facing material.
- G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.
 - 1. Provide and secure units to support screed strips
 - 2. Use strike-off templates or compacting-type screeds.
- H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.
 - 1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
 - 2. Locate temporary openings in forms at inconspicuous locations.
- I. Chamfer exterior corners and edges of permanently exposed concrete.
- J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.
- K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.
 - 1. Determine sizes and locations from trades providing such items.
- L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, and girders in the middle third of spans.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings.
 - a. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, in accordance with manufacturer's written instructions, before placing reinforcement.

3.2 INSTALLATION OF 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.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.
3. 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.
4. Install dovetail anchor slots in concrete structures, as indicated on Drawings.
5. Clean embedded items immediately prior to concrete placement.

3.3 INSTALLATION OF WATERSTOPS

A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm.

1. Install in longest lengths practicable.
2. Locate waterstops in center of joint unless otherwise indicated on Drawings.

3. Allow clearance between waterstop and reinforcing steel of not less than 2 times the largest concrete aggregate size specified in Section 033000 "Cast-in-Place Concrete."
 4. Secure waterstops in correct position at 12 inches o.c.
 5. Field fabricate joints in accordance with manufacturer's written instructions using heat welding.
 - a. Miter corners, intersections, and directional changes in waterstops.
 - b. Align center bulbs.
 6. Clean waterstops immediately prior to placement of concrete.
 7. Support and protect exposed waterstops during progress of the Work.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated on Drawings, in accordance with manufacturer's written instructions, by adhesive bonding, mechanically fastening, and firmly pressing into place.
1. Install in longest lengths practicable.
 2. Locate waterstops in center of joint unless otherwise indicated on Drawings.
 3. Protect exposed waterstops during progress of the Work.

3.4 REMOVING AND REUSING FORMS

- A. Formwork for sides of piers, 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. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support 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.
1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
 2. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
1. Align and secure joints to avoid offsets.
 2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.5 INSTALLATION OF SHORING AND RESHORING

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.

- B. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- C. Inspections:
 - 1. Inspect formwork for shape, location, and dimensions of the concrete member being formed.
 - 2. Inspect insulating concrete forms for shape, location, and dimensions of the concrete member being formed.
- D. Prepare test and inspection reports.

END OF SECTION 03 10 00

SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 32-1313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:
 - a. Special inspection and testing and inspecting agency procedures for field quality control.
 - b. Construction contraction and isolation joints.
 - c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Statements: For testing and inspection agency.
- B. Welding certificates.
 - 1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.
- C. Material Test Reports: For the following, from a qualified testing agency:
 - 1. Steel Reinforcement:
 - a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.
- D. Field quality-control reports.
- E. Minutes of preinstallation conference.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, hired by the contractor, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
- B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.
 - 1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.
- B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.
- C. Steel Bar Mats: ASTM A184/A184M, fabricated from ASTM A615/A615M, Grade 60, deformed bars, assembled with clips.
- D. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.
- E. Galvanized-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from

galvanized-steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.
 - b. For epoxy-coated reinforcement, use CRSI Class 1A epoxy-coated or other dielectric-polymer-coated wire bar supports.
- C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.
 - 1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

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

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protection of In-Place Conditions:
 - 1. Do not cut or puncture vapor retarder.
 - 2. 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 reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for placing and supporting reinforcement.
- B. Accurately position, support, and secure reinforcement against displacement.
 - 1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
 - 2. Do not tack weld crossing reinforcing bars.

- C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.
- D. Provide concrete coverage in accordance with ACI 318.
- E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- F. Splices: Lap splices as indicated on Drawings.
 - 1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
 - 2. Stagger splices in accordance with ACI 318.
- G. Install welded-wire reinforcement in longest practicable lengths.
 - 1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
 - a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.
 - 2. Lap edges and ends of adjoining sheets at least one wire spacing plus 6 inches for plain wire and 8 inches for deformed wire.
 - 3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

3.3 JOINTS

- A. 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.
 - 2. Continue reinforcement across construction joints unless otherwise indicated.
 - 3. Do not continue reinforcement through sides of strip placements of floors and slabs.
- B. 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.

3.4 INSTALLATION TOLERANCES

- A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:

1. Steel-reinforcement placement.

END OF SECTION 03 20 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete standards.
2. Concrete materials.
3. Fiber reinforcement.
4. Vapor retarders.
5. Curing materials.
6. Accessories.
7. Repair materials.
8. Concrete mixture materials.
9. Concrete mixture class types.
10. Concrete mixing.

B. Related Requirements:

1. Section 03-1000 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 03-2000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
3. Section 31-2000 "Earth Moving" for drainage fill under slabs-on-ground.
4. Section 32-1313 "Concrete Paving" for concrete pavement and walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement or blended hydraulic cement alone or in combination with one or more of the following:

1. Fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.

B. Water/Cementitious Materials (w/cm) Ratio: The ratio by weight of mixing water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. 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 inspections and acceptance testing of concrete at Project site.

- c. Ready-mix concrete manufacturer.
- d. Concrete Subcontractor.
- e. Special concrete finish Subcontractor.

2. Review the following:

- a. Special inspection and testing and inspecting agency procedures for field quality control.
- b. Construction joints, control joints, isolation joints, and joint-filler strips.
- c. Semirigid joint fillers.
- d. Vapor-retarder installation.
- e. Anchor rod and anchorage device installation tolerances.
- f. Cold- and hot-weather concreting procedures.
- g. Concrete finishes and finishing.
- h. Curing procedures.
- i. Forms and form-removal limitations.
- j. Shoring and reshoring procedures.
- k. Methods for achieving specified floor and slab flatness and levelness.
- l. Floor and slab flatness and levelness measurements.
- m. Concrete repair procedures.
- n. Concrete protection.
- o. Initial curing of standard-cured and field curing of field-cured test cylinders (ASTM C31/C31M.)
- p. Protection of field cured field test cylinders.
- q. Distribution of test reports.

1.4 ACTION SUBMITTALS

A. Product Data:

- 1. Portland cement.
- 2. Blended hydraulic cement.
- 3. Performance-based hydraulic cement.
- 4. Fly ash.
- 5. Slag cement.
- 6. Silica fume.
- 7. Natural or other pozzolans.
- 8. Aggregates.
- 9. Admixtures:

- a. Include limitations of use. Admixtures that do not comply with reference ASTM International requirements must be submitted with test data for approval.

- 10. Fiber reinforcement.
- 11. Vapor retarders.
- 12. Floor and slab treatments.
- 13. Liquid floor treatments.
- 14. Curing materials.
- 15. Joint fillers.
- 16. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

- 1. Mixture identification.

2. Compressive strength at 28 days or other age as specified.
3. Compressive strength required at stages of construction.
4. Durability exposure classes for Exposure Categories F, S, W, and C.
5. Maximum w/cm ratio.
6. Calculated equilibrium and fresh density for lightweight concrete.
7. Slump or slump flow limit.
8. Air content.
9. Nominal maximum aggregate size.
10. Synthetic microfiber content.
11. Intended placement method.
12. Submit adjustments to design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant changes.

C. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - a. Location of construction joints is subject to approval of the Architect.

D. Samples: For vapor retarder.

E. Concrete Schedule: For each location of each class of concrete indicated in "Concrete Mixture Class Types" Article, including the following:

1. Concrete class designation.
2. Location within Project.
3. Exposure class designation.
4. Formed surface finish designation and final finish.
5. Final finish for floors.
6. Floor treatment, if any.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Testing Agency: Include documentation indicating compliance with ASTM E329 or ASTM C1077 and copies of applicable ACI certificates for testing technicians or ACI Concrete Construction Special Inspector - MH, ASCC.

B. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.
3. Fiber reinforcement.
4. Curing compounds.
5. Floor and slab treatments.
6. Bonding agents.
7. Adhesives.
8. Vapor retarders.
9. Semirigid joint filler.
10. Joint-filler strips.
11. Repair materials.

- C. Material Test Reports: For the following:
 - 1. Portland cement.
 - 2. Blended hydraulic cement.
 - 3. Performance-based hydraulic cement.
 - 4. Fly ash.
 - 5. Slag cement.
 - 6. Silica fume.
 - 7. Natural or other pozzolans.
 - 8. Aggregates.
 - 9. Admixtures.
- D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances in accordance with ACI 117 and in compliance with ASTM E1155.
- E. Research Reports:
 - 1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.
 - 2. For sheet vapor retarder/termite barrier, showing compliance with ICC's Acceptance Criteria AC380.
- F. Preconstruction Test Reports: For each mix design.
- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified Installer who employs Project personnel qualified as an ACI-certified Concrete Flatwork Associate and Concrete Flatwork Finisher and a supervisor who is a certified ACI Advanced Concrete Flatwork Finisher/Technician or an ACI Concrete Flatwork Finisher with experience installing and finishing concrete.
 - 1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.
- B. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
- C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing that performs duties on behalf of the Architect/Engineer.
 - 1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Level 1. Testing agency laboratory supervisor tests to be an ACI-certified Concrete Laboratory Testing Technician, Level 2.
- D. Field Quality-Control Testing Agency Qualifications: An independent agency, hired by the Owner, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests on plastic concrete properties are to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with policies from ACI

CPP 610.1 or an equivalent certification program.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on each concrete mixture.
 - 1. Include the following information in each test report:
 - a. Admixture dosage rates.
 - b. Slump.
 - c. Air content.
 - d. Seven-day compressive strength.
 - e. 28-day compressive strength.
 - f. Evaluation of permeability-reducing admixtures.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with ASTM C94/C94M and ACI 301.

1.9 FIELD CONDITIONS

- A. Cold-Weather Placement: Comply with ACI 301 as follows:
 - 1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 2. When air temperature has fallen to, or is expected to fall below 40 deg F during the protection period, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 3. Do not use frozen materials or materials containing ice or snow.
 - 4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
- B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:
 - 1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

1.10 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CONCRETE STANDARDS

- A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

- A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type of admixture from single source from single manufacturer.

- B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I, gray.
2. Blended Hydraulic Cement: ASTM C595/C595M, Type IP, Portland-pozzolan cement.
3. Performance-Based Hydraulic Cement: ASTM C1157/C1157M: Type GU, general use.
4. Pozzolans: ASTM C618, Class C, F, or N.
5. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
6. Silica Fume: ASTM C1240.

- C. Normal-Weight Aggregates:

1. Coarse Aggregate: ASTM C33/C33M, Class 1N , Exterior concrete to have Class 3M.
2. Maximum Coarse-Aggregate Size: 1 inch nominal.
3. Fine Aggregate: ASTM C33/C33M.
4. Recycled Aggregate: Provide documentation of characteristics of recycled aggregate and mechanical properties and durability of proposed concrete, which incorporates recycled aggregate to conform to applicable requirements for the class of concrete.

- D. Lightweight Aggregate: ASTM C330/C330M, 1-inch nominal maximum aggregate size.

1. Limit lightweight aggregate for internal curing to prewetted lightweight fine aggregate in accordance with ASTM C1761/C1761M.

2.3 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C260/C260M.

- B. Chemical Admixtures: Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

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

- C. Mixing Water for Concrete Mixtures and Water Used to Make Ice: ASTM C1602/C1602M. Include documentation of compliance with limits for alkalis, sulfates, chlorides, or solids content of mixing water from Table 2 in ASTM C1602/C1602M.

2.4 FIBER REINFORCEMENT

- A. Synthetic Fibrillated Microfiber: Fibrillated polypropylene microfibers complying with ASTM C1116/C1116M, Type III, 1/2 to 1-1/2 inches long.
 - 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. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
 - b. FullForce by ABC Polymer Industries, LLC
 - c. Master Builders Solutions
 - d. Sika Corporation

2.5 VAPOR RETARDERS

- A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A. Include manufacturer's recommended thickness and adhesive or pressure-sensitive tape.
 - 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. Barrier-Bac; Inteplast Group
 - b. ISI Building Products
 - c. Poly-America, L.P.
 - d. Reef Industries, Inc.
 - e. Stego Industries, LLC
 - f. W. R. Meadows, Inc

2.6 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.
 - 1. Color:
 - a. Ambient Temperature Below 50 deg F (10 deg C): Black.
 - b. Ambient Temperature between 50 and 85 deg F (10 and 29 deg C): Any color.
 - c. Ambient Temperature Above 85 deg F (29 deg C): White.
- C. Water: Potable water that does not cause staining of the surface.
- D. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B.

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. ChemMasters, Inc
 - b. Dayton Superior Corporation
 - c. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
 - d. Kaufman Products, Inc
 - e. MAPEI Corporation
 - f. SpecChem, LLC
 - g. Vexcon Chemicals Inc.
 - h. W. R. Meadows, Inc

E. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A.

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. ChemMasters, Inc
 - b. Dayton Superior Corporation
 - c. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
 - d. Kaufman Products, Inc
 - e. MAPEI Corporation
 - f. SpecChem, LLC
 - g. Vexcon Chemicals Inc.
 - h. W. R. Meadows, Inc

2.7 ACCESSORIES

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber for exterior concrete, and ASTM D1752, cork or self-expanding cork for interior concrete.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 in accordance with ASTM D2240.
- C. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.8 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 C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 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 in accordance with ASTM C109/C109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
 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 in accordance with ASTM C109/C109M.

2.9 CONCRETE MIXTURE MATERIALS

- 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, in accordance with ACI 301.
1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland or hydraulic cement in concrete assigned to Exposure Class F3 as follows:
1. Fly Ash or Other Pozzolans: 25 percent by mass.
 2. Slag Cement: 50 percent by mass.
 3. Silica Fume: 10 percent by mass.
 4. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
- C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

2.10 CONCRETE MIXTURE CLASS TYPES

- A. Class A: Normal-weight concrete used for footings, foundation walls, piers.
1. Exposure Class: ACI 318 Class F1.
 2. Minimum Compressive Strength: 4000 psi at 28 days.
 3. Maximum w/cm Ratio: 0.50.
 4. Slump Limit: 5 inches, plus or minus 1-1/2 inches for concrete.
 5. Air Content:

- a. Exposure Class F1: 4.5 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cementitious materials.
- B. Class B: Normal-weight concrete used for exterior foundations, exterior retaining walls, exterior slabs on grade.
 1. Exposure Class: ACI 318 Class F2.
 2. Minimum Compressive Strength: 4500 psi at 28 days.
 3. Maximum w/cm Ratio: 0.45.
 4. Slump Limit: 5 inches, plus or minus 1.5 inches for concrete.
 5. Air Content:
 - a. Exposure Classes F2: 6.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.
 6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- C. Class C: Normal-weight concrete used for interior slabs-on-ground.
 1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Maximum w/cm Ratio : 0.55.
 3. Slump Limit: 5 inches, plus or minus 1.5 inches for concrete.
 4. Air Content:
 - a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
 6. Synthetic Microfiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than a rate of 1.5 lb/cu. yd..
- D. Class D: Structural lightweight concrete used for interior suspended slabs on metal deck and infill topping slabs.
 1. Minimum Compressive Strength: 3500 psi at 28 days.
 2. Equilibrium Density: 113 lb/cu. ft., plus or minus 3 lb/cu. ft. in accordance with ASTM C567/C567M and to meet UL D902.
 3. Slump Limit: 5 inches, plus or minus 1.5 inches for concrete.
 4. Air Content:
 - a. Total air content must not to exceed 3 percent for concrete used in trowel-finished floors.
 5. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.
- E. Class E: Normal-weight concrete used for interior metal pan stairs and landings:

1. Minimum Compressive Strength: 3000 psi at 28 days.
2. Maximum w/cm Ratio: 0.53.
3. Maximum Size Aggregate: 1/2 inch.
4. Slump Limit: 3 inches, plus 1 inch or minus 2 inches.
5. Air Content: 0 percent, plus or minus 1.5 percent at point of delivery.
6. Limit water-soluble, chloride-ion content in hardened concrete to 1.00 percent by weight of cement.

2.11 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M and furnish delivery ticket.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. 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 five 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 EXAMINATION

- A. Verification of Conditions:
 1. Before placing concrete, verify that installation of concrete forms, accessories, reinforcement, and embedded items is complete and that required inspections have been performed.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:
 1. Daily access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
 4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 TOLERANCES

- A. Comply with ACI 117.

3.4 INSTALLATION OF 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.
 - 1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 2. Install reglets to receive waterproofing and through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.
 - 1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
 - 2. Face laps away from exposed direction of concrete pour.
 - 3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
 - 4. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
 - 6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
 - 7. Protect vapor retarder during placement of reinforcement and concrete.
 - a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides and sealing to vapor retarder.

3.6 INSTALLATION OF CAST-IN-PLACE CONCRETE

- A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.
 - 1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
 - 2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.
- B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.
- C. Water addition in transit or at the Project site must be in accordance with ASTM C94/C94M and must not exceed the permitted amount indicated on the concrete delivery ticket.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of

weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
 2. Deposit concrete to avoid segregation.
 3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
 4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.
 - a. Do not use vibrators to transport concrete inside forms.
 - b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
 - c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
 - d. 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. Do not place concrete floors and slabs in a checkerboard sequence.
 2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 3. Maintain reinforcement in position on chairs during concrete placement.
 4. Screed slab surfaces with a straightedge and strike off to correct elevations.
 5. Level concrete, cut high areas, and fill low areas.
 6. Slope surfaces uniformly to drains where required.
 7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
 8. Do not further disturb slab surfaces before starting finishing operations.

3.7 INSTALLATION OF JOINTS

- A. Construct joints true to line, with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.
1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
 2. Place joints perpendicular to main reinforcement.
 - a. Continue reinforcement across construction joints unless otherwise indicated.
 3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
 7. Use a bonding agent at locations where fresh concrete is placed against hardened or

- partially hardened concrete surfaces.
8. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces for exterior concrete and concrete within the Central Utility Plant.
- C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
 2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.
- D. Isolation Joints in Slabs-on-Ground: 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 on Drawings.
 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 Section 079200 "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:
1. Install dowel bars and support assemblies at joints where indicated on Drawings.
 2. Lubricate or asphalt coat one-half of dowel bar length to prevent concrete bonding to one side of joint.
- 3.8 APPLICATION OF FINISHING FLOORS AND SLABS
- A. Scratch Finish:
1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
 2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
 3. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
- B. Float Finish:
1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
 2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.

3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.

C. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface. Use of an approved finishing aid is acceptable.
5. Do not apply troweled finish to concrete, which has a total air content greater than 3 percent.
6. 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.
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:

a. Slabs on Ground:

- 1) Specified overall values of flatness, FF 35; and of levelness, FL 25; with minimum local values of flatness, FF 24; and of levelness, FL 17.

D. Trowel and Fine-Broom Finish: First apply a trowel finish to surfaces indicated on Drawings. While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with a fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 APPLICATION OF FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 (ACI 301M) Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.
 - a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
 - b. Remove projections larger than 1/4 inch.
 - c. Patch tie holes.
 - d. Surface Tolerance: ACI 117, Class B.
 - e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish,.

B. Rubbed Finish: Apply the following to as-cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish: (Exposed Retaining Walls, Loading Dock Face, and As Noted)
 - a. Perform no later than one day after form removal.
 - b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
 - c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.
 - d. Maintain required patterns or variances as shown on Drawings or to match design reference sample mockups.

3.10 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling in:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to match color and texture with in-place construction exposed to view.
3. 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 troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches minimum in height high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4000 psi at 28 days.
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 substrate.
6. Prior to pouring concrete, place and secure anchorage devices.
 - a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - b. Cast anchor-bolt insert into bases.
 - c. Install anchor bolts to elevations required for proper attachment to supported equipment.

D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items.

1. Cast-in inserts and accessories, as shown on Drawings.
2. Screed, tamp, and trowel finish concrete surfaces.

3.11 APPLICATION OF CONCRETE CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.
1. Comply with ACI 301 for cold weather protection during curing.
 2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
 3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305R, before and during finishing operations.
- B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:
1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
 2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
 3. If forms remain during curing period, moist cure after loosening forms.
 4. If removing forms before end of curing period, continue curing for remainder of curing period as follows:
 - a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
 - b. Continuous Sprinkling: Maintain concrete surface continuously wet.
 - c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.
 - d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
 - e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
 - 1) Recoat areas subject to heavy rainfall within three hours after initial application.
 - 2) Maintain continuity of coating and repair damage during curing period.
- C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:
1. Begin curing after finishing concrete.
 2. Interior Concrete Floors:
 - a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
 - 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.

- a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following not in cold weather:
 - a) Water.
 - b) Continuous water-fog spray.
- b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 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.
 - a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
 - b) Cure for not less than seven days.
 - 3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.
- c. Floors to Receive Polished Finish: Contractor has option of the following:
- 1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
 - a) Lap edges and ends of absorptive cover not less than 12 inches.
 - b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.
 - 2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
 - a) Water.
 - b) Continuous water-fog spray.

d. Floors To Receive Curing Compound:

- 1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Maintain continuity of coating, and repair damage during curing period.
- 4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer.

e. Floors To Receive Curing and Sealing Compound:

- 1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
- 2) Recoat areas subjected to heavy rainfall within three hours after initial application.
- 3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.12 INSTALLATION OF JOINT FILLING

- A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.
 1. Defer joint filling until concrete has aged at least one month(s) or as agreed upon for project schedule and manufacturer installation instructions and/or warranties.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.
- D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 INSTALLATION OF CONCRETE SURFACE REPAIRS

- A. Defective Concrete:
 1. Repair and patch defective areas when approved by Architect.
 2. Remove and replace concrete that cannot be repaired and patched to meet specification requirements.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 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 in excess of 0.01 inch spalls, air bubbles exceeding surface finish limits, honeycombs, rock pockets, fins and other projections on the surface exceeding surface finish limits, and stains and other discolorations that cannot be removed by cleaning.
 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than

1/2 inch in any dimension to solid concrete.

- a. Limit cut depth to 3/4 inch.
 - b. Make edges of cuts perpendicular to concrete surface.
 - c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
 - d. Fill and compact with patching mortar before bonding agent has dried.
 - e. 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 matches surrounding color.
 - a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
 - b. Compact mortar in place and match surrounding surface.
3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance, as determined by Architect.

D. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
 - a. Correct low and high areas.
 - b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
2. Repair finished surfaces containing surface defects, including 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.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by adding patching mortar.
 - a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
 - a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
 - a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
 - b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in

diameter, by cutting out and replacing with fresh concrete.

- a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
 - b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
 - c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
 - d. Place, compact, and finish to blend with adjacent finished concrete.
 - e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
- a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
 - b. Dampen cleaned concrete surfaces and apply bonding agent.
 - c. Place patching mortar before bonding agent has dried.
 - d. Compact patching mortar and finish to match adjacent concrete.
 - e. 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.

3.14 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.
- B. Testing Agency: a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
1. Testing agency to be responsible for providing curing facility for initial curing of strength test specimens on-site and verifying that test specimens are cured in accordance with standard curing requirements in ASTM C31/C31M.
 2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
 3. Testing agency to report results of tests and inspections, in writing, to the Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
 - a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
 - 1) Project name.
 - 2) Name of testing agency.
 - 3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
 - 4) Name of concrete manufacturer.
 - 5) Date and time of inspection, sampling, and field testing.

- 6) Date and time of concrete placement.
 - 7) Location in Work of concrete represented by samples.
 - 8) Date and time sample was obtained.
 - 9) Truck and batch ticket numbers.
 - 10) Design compressive strength at 28 days.
 - 11) Concrete mixture designation, proportions, and materials.
 - 12) Field test results of fresh concrete, including slump or slump flow, air content, temperature and density.
 - 13) Information on storage and curing of samples at the Project site, including curing method and maximum and minimum temperatures during initial curing period.
 - 14) Type of fracture and compressive break strengths at seven days and 28 days.
4. Provide a space and source of power or other resources for curing and access to test specimens by the testing agency.
- C. Delivery Tickets: comply with ASTM C94/C94M.
- D. Inspections:
1. Headed bolts and studs.
 2. Verification of use of required design mixture.
 3. Concrete placement, including conveying and depositing.
 4. Curing procedures and maintenance of curing temperature.
 5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.
- E. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with 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 150 cu. yd. or fraction thereof.
 - a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing is to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M:
 - a. One test at point of delivery for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.
 3. Slump Flow: ASTM C1611/C1611M:
 - a. One test at point of delivery for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
 - b. Perform additional tests as needed.

4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete; ASTM C173/C173M volumetric method, for structural lightweight concrete.
 - a. One test for each composite sample when strength test specimens are cast, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM C1064/C1064M:
 - a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample when strength test specimens are cast.
6. Concrete Density: ASTM C138/C138M:
 - a. One test for each composite sample when strength test specimens are cast.
7. Unit Weight: ASTM C138/C138M density of fresh structural lightweight concrete.
 - a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture. The fresh density should be consistent with that associated with the equilibrium density within a tolerance of plus or minus 4 lb/ft.³.
8. Compression Test Specimens: ASTM C31/C31M:
 - a. Cast and standard cure two sets of two 6 inches by 12-inches or 4-inch by 8-inch cylindrical specimens for each composite sample.
9. Compressive-Strength Tests: ASTM C39/C39M.
 - a. Test one set of two standard cured specimens at seven days and one set of two specimens at 28 days.
 - b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
10. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
11. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests of standard cured cylinders equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.
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:
 - a. Testing and inspecting agency to 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.

- b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.
 - 1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.7.6.3.
 - 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 do not comply with the Contract Documents.
- F. Measure floor and slab flatness and levelness in accordance with ASTM E1155 within 24 hours of completion of floor finishing and promptly report test results to Architect.

3.15 PROTECTION

- A. Protect concrete surfaces as follows:
- 1. Protect from petroleum stains.
 - 2. Diaper hydraulic equipment used over concrete surfaces.
 - 3. Prohibit vehicles from interior concrete slabs.
 - 4. Prohibit use of pipe-cutting machinery over concrete surfaces.
 - 5. Prohibit placement of steel items directly on concrete surfaces. Place on wood blocks or other means to elevate off of concrete during storage or staging.
 - 6. Prohibit use of acids or acidic detergents over concrete surfaces.
 - 7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
 - 8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using floor slab protective covering.

END OF SECTION 03 30 00

SECTION 04 20 00 - UNIT MASONRY

PART 1 - GENERAL

1.1 ALLOWANCES

- A. See Section 01-2100 "Allowances" for description of allowances affecting items specified in this Section.

1.2 SUMMARY

A. Section Includes:

- 1. Concrete masonry units.
- 2. Mortar and grout materials.
- 3. Reinforcement.
- 4. Ties and anchors.
- 5. Mortar and grout mixes.

B. Products Installed but not Furnished under This Section:

- 1. Steel lintels in unit masonry.
- 2. Steel shelf angles for supporting unit masonry.

C. Related Requirements:

- 1. Section 01-4339 "Mockups" for integrated exterior mockup requirements.
- 2. Section 03-1000 "Concrete Forms and Accessories" for installing dovetail or channel slots for masonry-veneer anchors.
- 3. Section 05-1200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For the following:

1. Masonry Units: Indicate sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Indicate bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315R. Indicate elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Verification: For each type and color of the following:

1. Exposed CMUs.
2. Pre-faced CMUs.
3. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
- B. Material Certificates: For each type of the following:
1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 2. Integral water repellent used in CMUs.
 3. Cementitious materials. Include name of manufacturer, brand name, and type.
 4. Mortar admixtures.
 5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 6. Grout mixes. Include description of type and proportions of ingredients.
 7. Reinforcing bars.
 8. Joint reinforcement.
 9. Anchors, ties, and metal accessories.
- C. Qualification Statements: For testing agency.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
 2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.
- E. Statement of Compressive Strength of Masonry: 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 in accordance with TMS 602.
- F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

A. Qualifications:

1. Installers: All masonry flashing installers must complete the International Masonry Institute Flashing Upgrade training course.
2. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.8 MOCKUPS

- A. Sample Panel Mockups: Build sample panels to verify selections made under Sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.

1.9 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.
- 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. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 FIELD CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three 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 TMS 602.
1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. For exposed masonry units cementitious mortar components, obtain each color and grade from single source with resources to provide materials of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days.
1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) in accordance with TMS 602.

2.3 UNIT MASONRY, GENERAL

- A. Masonry Standard: Comply with TMS 602, except as modified by requirements in the Contract Documents.
- B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 ft. vertically and horizontally of a walking surface.
- C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs

indicated.

1. Where fire-resistance-rated construction is indicated, use the equivalent thickness method for masonry units in accordance with ACI 216.1.

2.4 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 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. CMUs: ASTM C90, medium weight unless otherwise indicated.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
 2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.5 LINTELS

- A. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C150/C150M, Type I or 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. Alkali content will not be more than 0.1 percent when tested in accordance with ASTM C114.
- B. Hydrated Lime: ASTM C207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Masonry Cement: ASTM C91/C91M.
 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. Cemex S.A.B. de C.V.
 - b. Heidelberg Materials
 - c. Quikrete; The QUIKRETE Companies, LLC
 - d. Sakrete; CRH Americas, Oldcastle APG

- E. Preblended Dry Mortar Mix: Packaged blend made from portland cement and hydrated lime, sand, and admixtures and complying with ASTM C1714/C1714M.
 - 1. Preblended Dry Portland Cement Mortar Mix:
 - 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) Amerimix is a trademark of Bonsal American, an Oldcastle company
 - 2) Quikrete; The QUIKRETE Companies, LLC
 - 3) Sakrete; CRH Americas, Oldcastle APG
 - 4) SPEC MIX, LLC
- F. Aggregate for Mortar: ASTM C144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
- G. Aggregate for Grout: ASTM C404.
- H. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
 - b. GCP Applied Technologies Inc.
- I. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. 3GEN Masonry Products, Inc.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc
 - d. Wire-Bond

- C. Masonry-Joint Reinforcement, General: ASTM A951/A951M.
1. Interior Walls: Hot-dip galvanized carbon steel.
 2. Exterior Walls: Hot-dip galvanized carbon steel.
 3. Wire Size for Side Rods: 0.148-inch diameter.
 4. Wire Size for Cross Rods: 0.148-inch diameter.
 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 6. Provide in lengths of not less than 10 ft., with prefabricated corner and tee units.
- D. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder or truss type with single pair of side rods.
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. 3GEN Masonry Products, Inc.
 - b. Hohmann & Barnard, Inc
 - c. Wire-Bond
- E. Masonry-Joint Reinforcement for Multiwythe Masonry:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. 3GEN Masonry Products, Inc.
 - b. Heckmann Building Products, Inc.
 - c. Hohmann & Barnard, Inc
 - d. Wire-Bond
 2. Tab type, either ladder or truss design, with one side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe, but with at least 5/8-inch cover on outside face.

2.8 TIES AND ANCHORS

- A. General: Ties and anchors extend at least 1-1/2 inches into veneer but with at least a 5/8-inch cover on outside face.
- B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A1064/A1064M, with ASTM A153/A153M, Class B-2 coating.
 2. Steel Sheet, Galvanized after Fabrication: ASTM A1008/A1008M, Commercial Steel, with ASTM A153/A153M, Class B coating.
- C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise

- indicated.
2. Tie Section: Triangular-shaped wire tie made from 0.25-inch- diameter, hot-dip galvanized steel wire. Mill-galvanized wire may be used at interior walls unless otherwise indicated.
- D. Partition Top Anchors: 0.105-inch- thick metal plate with a 3/8-inch- diameter metal rod 6 inches long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- E. Adjustable Masonry-Veneer Anchors:
1. General: Provide anchors that allow vertical adjustment but resist a 100 lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
 2. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel wire unless otherwise indicated.
 3. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.

2.9 ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Preformed Control-Joint Gaskets: Made from PVC, complying with ASTM D2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

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. Use portland cement-lime mortar unless otherwise indicated.
 3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
1. For masonry below grade or in contact with earth, use Type M.

2. For reinforced masonry, use Type M or Type S.
 3. For exterior, above-grade, load-bearing, nonload-bearing walls, and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior nonload-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C476.
1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C476, Table 1.
 3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

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 the Work.
1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
 4. Verify that substrates are free of substances that impair mortar bond.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. 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.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.

- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 ft., or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
4. 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 ft., 1/4 inch in 20 ft., or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 ft., 3/8 inch in 20 ft., or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 ft., or 1/2-inch maximum.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.

3.4 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, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less

than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

- D. Stopping and Resuming Work: Stop work by stepping 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, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. 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.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors, and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- 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.
- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. 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 STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: 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.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs 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.
 - 4. Install temporary foam-plastic filler in head joints, and remove filler when unit masonry is complete for application of sealant.

3.9 REINFORCED UNIT MASONRY

- 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 that of other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in TMS 602.
- 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 TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements will be at Contractor's expense.
- B. Inspections: Special inspections in accordance with Level 3 in TMS 402.
1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. As an alternative method of full time special inspection, the contractor may mark, in an approved manner, the location of filled cores for the QA Agent to verify the presence of reinforcing steel using a rebar locator and the presence of grout using an ultrasound device.
- D. Testing Prior to Construction: One set of tests.
- E. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- F. Concrete Masonry Unit Test: For each type of unit provided, in accordance with ASTM C140/C140M for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, in accordance with ASTM C780.
- H. Mortar Test (Property Specification): For each mix provided, in accordance with ASTM C780. Test mortar for mortar air content and compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, in accordance with ASTM C1019.

- J. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 7 days and at 28 days.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. 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.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. 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. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
 - 6. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.
 - 7. Clean masonry with a proprietary acidic masonry cleaner applied according to manufacturer's written instructions.

3.12 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 312000 "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.
- D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as

described above or recycled, and other masonry waste, and legally dispose of off the Institution's property.

END OF SECTION 04 20 00

SECTION 05 12 00 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

1. Structural-steel materials.
2. Shrinkage-resistant grout.
3. Shear stud connectors.

B. Related Requirements:

1. Section 05-3100 "Steel Decking" for field installation of shear stud connectors through deck.
2. Section 05-5000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame miscellaneous steel fabrications and other steel items not defined as structural steel.
3. Section 09-9113 "Exterior Painting" and Section 09-9123 "Interior Painting" for painting requirements.

1.2 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

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

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.
4. Anchor rods.

5. Threaded rods.
6. Slide bearings.
7. Shop primer.
8. Galvanized-steel primer.
9. Etching cleaner.
10. Galvanized repair paint.
11. Shrinkage-resistant grout.

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

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

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M 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.

D. Delegated Design Submittal: For structural-steel connections indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer and fabricator.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Mill test reports for structural-steel materials, including chemical and physical properties.

E. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Tension-control, high-strength, bolt-nut-washer assemblies.
3. Shear stud connectors.

F. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification

Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P2 or to SSPC-QP 3.
- D. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.8 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 the testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with applicable provisions of the following specifications and documents:
 - 1. ANSI/AISC 303.
 - 2. ANSI/AISC 341.
 - 3. ANSI/AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using High-Strength Bolts."
- B. Connection Design Information:
 - 1. Option 3 and 3B: Design connections and final configuration of member reinforcement at connections in accordance with ANSI/AISC 303 by fabricator's qualified professional engineer.
 - a. Use Load and Resistance Factor Design; data are given at factored-load level.
- C. Moment Connections: Type PR, partially and Type FR, fully restrained.

- D. Construction: Combined system of moment frame and braced frame.

2.2 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A992/A992M.
- C. Channels, Angles, M-Shapes: ASTM A36/A36M.
- D. Plate and Bar: ASTM A36/A36M.
- E. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade B structural tubing.
- F. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.
 - 1. Weight Class: As Indicated.
 - 2. Finish: Black.
- G. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

- A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- B. High-Strength A490 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A490, Type 1, heavy-hex steel structural bolts or Grade F2280 tension-control, bolt-nut-washer assemblies with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.
- C. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round head assemblies, consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.
 - 1. Finish: Plain.
- E. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

2.4 RODS

- A. Unheaded Anchor Rods: ASTM F1554, Grade 36 or ASTM F1554, Grade 55, weldable, as specified on drawings.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A36/A36M carbon steel.
 - 4. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 5. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C, pending exposure as indicated on drawings.
- B. Headed Anchor Rods: ASTM F1554, Grade 36 or ASTM F1554, Grade 55, weldable, as specified on drawings, straight.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A36/A36M carbon steel.
 - 3. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 4. Finish: Plain or Hot-dip zinc coating, ASTM A153/A153M, Class C, pending exposure as indicated on drawings.
- C. Threaded Rods: ASTM A36/A36M.
 - 1. Nuts: ASTM A563 heavy-hex carbon steel.
 - 2. Washers: ASTM F436, Type 1, hardened carbon steel.
 - 3. Finish: Plain.

2.5 PRIMER

- A. Steel Primer:
 - 1. Comply with Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 2. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- B. Galvanized-Steel Primer: MPI#26.
 - 1. Etching Cleaner: MPI#25, for galvanized steel.
 - 2. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.

2.6 SHRINKAGE-RESISTANT GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
 2. Fabricate beams with rolling camber up.
 3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing 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, mechanically thermal cut, 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 in accordance with SSPC-SP 2.
- F. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using automatic end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel 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.

2.8 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: Snug tightened.
- 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.

2.9 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel in accordance with ASTM A123/A123M.
1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.

2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.10 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 of high-strength bolted, slip-critical connections.
 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 5. Galvanized surfaces unless indicated to be painted.
 6. Surfaces enclosed in interior construction.
- B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:
 1. SSPC-SP 2.
- C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.
- D. Priming: Immediately after surface preparation, apply primer in accordance with 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.

2.11 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform shop tests and inspections.
 1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
 2. Bolted Connections: Inspect and test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 3. Welded Connections: Visually inspect shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E165/E165M.
 - b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E164.
 4. In addition to visual inspection, test and inspect shop-welded shear stud connectors in

accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:

- a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear stud connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear stud connectors if weld fracture occurs on shear stud connectors already tested.
5. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with certified 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 existing conditions. Include 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 on Drawings.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.
- B. Baseplates, Bearing Plates, 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 shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.
- C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

- 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 are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
- 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.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.
 - 1. Joint Type: Snug tightened.
- 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.
 - 1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.
- C. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.5 REPAIR

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:
 - 1. 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.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

3.6 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
 - 1. Bolted Connections: Inspect bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
 - 2. Welded Connections: Visually inspect field welds in accordance with AWS D1.1/D1.1M.
 - a. In addition to visual inspection, test and inspect field welds in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1) Liquid Penetrant Inspection: ASTM E165/E165M.
 - 2) Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3) Ultrasonic Inspection: ASTM E164.
 - 4) Radiographic Inspection: ASTM E94/E94M.
 - 3. Shear Stud Connectors: 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:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

END OF SECTION 05 12 00

SECTION 05 12 13 - ARCHITECTURALLY EXPOSED STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Architecturally exposed structural steel (AESS).
2. Section 051200 "Structural Steel Framing" requirements that also apply to AESS.

B. Related Requirements:

1. Section 055000 "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.
2. [Section 099113 "Exterior Painting"][Section 099123 "Interior Painting"][and][Section 099600 "High-Performance Coatings"] for surface preparation and priming requirements.

1.2 DEFINITIONS

- A. AESS: Architecturally exposed structural steel.
- B. Category AESS 3: Structural steel that is categorized by ANSI/AISC 303, Section 10, as AESS 3 and is designated as AESS 3 or Category AESS 3 in the Contract Documents.
- C. Category AESS C: Structural steel with custom characteristics that is categorized by ANSI/AISC 303, Section 10, as AESS C and is designated as AESS C or Category AESS C in the Contract Documents.
- D. SEAC/RMCSA Guide Specification: SEAC/RMCSA's "Sample Specification, Section 05 02 13: Architecturally Exposed Structural Steel."

1.3 COORDINATION

- A. Coordinate surface preparation requirements for shop-primed items.
- B. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Tension-control, high-strength, bolt-nut-washer assemblies.
2. Corrosion-resisting (weathering steel), tension-control, high-strength, bolt-nut-washer assemblies.
3. Filler.
4. Primer.
5. Galvanized-steel primer.
6. Etching cleaner.
7. Galvanized repair paint.

B. Shop Drawings: Show fabrication of AESS components.[Shop Drawings for structural steel may be used for AESS.]

1. Identify AESS category for each steel member and connection, including transitions between AESS categories and between AESS and non-AESS.
2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
3. Include embedment Drawings.
4. Indicate orientation of mill marks and HSS seams.
5. 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.]
6. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections. Indicate orientation and location of bolt heads.
7. Indicate exposed surfaces and edges and surface preparation being used.
8. Indicate special tolerances and erection requirements.
9. Indicate weep holes for HSS [and vent holes for galvanized HSS].
10. Indicate surface preparation, primer, and coating requirements, including systems specified in other Sections.

C. Samples: Submit Samples to set quality standards for 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].

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For [Installer][fabricator][shop-painting applicator].

- B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172) and is experienced in fabricating AESS similar to that indicated on this Project.
- B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program, is designated an AISC-Certified Erector, [Category ACSE][Category CSE], and is experienced in erecting AESS similar to that indicated on this Project.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint [Endorsement P1][Endorsement P2][Endorsement P3] or SSPC-QP 3.
- 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 painting requirements with [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."]
 - 3. Coordinate high-performance coatings requirements with Section 099600 "High-Performance Coatings."
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Use special care in handling AESS to prevent twisting, warping, nicking, and other damage during fabrication, delivery, and erection. Store materials to permit easy access for inspection and identification. Keep AESS members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect AESS members and packaged materials from corrosion and deterioration.
 - 1. Do not store AESS 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.

1.9 FIELD CONDITIONS

- A. Field Measurements: Where AESS is indicated to fit against other construction, verify actual dimensions by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of ANSI/AISC 303, Sections 1 through 9 and as modified in Section 10, "Architecturally Exposed Structural Steel."

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 1, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

- 1. Finish: [Plain][Mechanically deposited zinc coating].

- B. Corrosion-Resisting (Weathering) Steel, Tension-Control, High-Strength, Bolt-Nut-Washer Assemblies: ASTM F3125/F3125M, Grade F1852, Type 3, round-head assemblies consisting of steel structural bolts with splined ends; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 3, hardened carbon-steel washers.

2.3 FILLER

- A. Polyester filler intended for use in repairing dents in automobile bodies.

2.4 PRIMER

- A. Steel Primer:

- 1. Comply with [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]
 - 2. SSPC-Paint 23, latex primer.
 - 3. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

- B. Galvanized-Steel Primer: [MPI#26][MPI#80][MPI#134].

- 1. Etching Cleaner: MPI#25, for galvanized steel.
 - 2. Galvanizing Repair Paint: [MPI#18, MPI#19, or SSPC-Paint 20][ASTM A780/A780M].

2.5 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.

1. Use special care handling and fabricating AESS before and after shop painting to minimize damage to shop finish.

B. Category AESS 3:

1. Comply with overall profile dimensions of AWS D1.1/D1.1M for welded built-up members. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
2. Prepare surfaces according to Part 2 "Shop Priming" Article and SSPC-SP 6 (WAB)/NACE WAB-3.
3. Grind sheared, punched, and flame-cut edges to remove burrs and provide smooth surfaces and eased edges.
4. Make intermittent welds appear continuous, using filler or additional welding.
5. Seal weld open ends of hollow structural sections with 3/8-inch closure plates.
6. Limit butt and plug weld projections to 1/16 inch.
7. Install bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
8. Remove weld spatter, slivers, and similar surface discontinuities.
9. Remove blemishes and surface irregularities resulting from temporary braces or fixtures by filling or grinding, before cleaning, treating, and shop priming.
10. Grind tack welds smooth unless incorporated into final welds.
11. Remove backing and runoff tabs, and grind welds smooth.
12. Limit as-fabricated straightness tolerance to one-half that permitted for structural-steel materials in ANSI/AISC 303.
13. Limit as-fabricated curved structural steel tolerance to that permitted for structural-steel materials in ANSI/AISC 303.
14. Limit as-fabricated straightness tolerance of welded built-up members to one-half that permitted by AWS D1.1/D1.1M.
15. Conceal fabrication and erection markings from view in the completed structure.
16. Make welds uniform and smooth.
17. Cut out mill marks from mill material or hide these markings from view in the completed structure. Where neither method is possible, remove mill marks by grinding and filling surfaces as approved by Architect.
18. Grind butt and plug welds smooth or fill, removing weld splatter exposed to view.
19. Orient HSS seams as indicated or away from view.
20. Align and match abutting member cross sections.
21. At visible open joints of copes, miters, and cuts, maintain uniform clear gaps of 1/8 inch. At closed joints, maintain uniform contact within 1/16 inch.
22. Fabricate with exposed surfaces smooth, square, and of surface quality approved by Architect.

- C. Erection marks, painted marks, and other marks are permitted on [galvanized-][corrosion-resisting (weathering)] steel surfaces of completed structure.

- D. Cleaning Corrosion-Resisting (Weathering) AESS: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 6 (WAB)/NACE WAB-3.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: [Snug tightened][Pretensioned][Slip critical].
- 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.

2.7 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A123/A123M.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - 3. Galvanize AESS [lintels]<Insert description> attached to structural-steel frame and located in exterior walls.

2.8 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. Corrosion-resisting (weathering) steel surfaces.
 - 5. Galvanized surfaces [unless indicated to be painted].
- B. Surface Preparation: Clean nongalvanized 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.
 - 2. SSPC-SP 3.
 - 3. SSPC-SP 7 (WAB)/NACE WAB-4.
 - 4. SSPC-SP 14 (WAB)/NACE WAB-8.
 - 5. SSPC-SP 11.
 - 6. SSPC-SP 6 (WAB)/NACE WAB-3.
 - 7. SSPC-SP 10 (WAB)/NACE WAB-2.
 - 8. SSPC-SP 5 (WAB)/NACE WAB-1.
 - 9. SSPC-SP 8.

- 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 [or according to SSPC-SP 16].
- 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 eased 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 AECS 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 AECS 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.

3.3 ERECTION

- A. Take special care during erection to avoid marking or distorting the AECS and to minimize damage to shop painting. Set AECS accurately in locations and to elevations indicated and according to ANSI/AISC 303 and ANSI/AISC 360.
 - 1. Remove welded tabs that were used for attaching temporary bracing and safety cabling and that are exposed to view in the completed Work. Take care to avoid any blemishes, holes, or unsightly surfaces resulting from the use or removal of temporary elements.
 - 2. Grind tack welds smooth.
 - 3. Remove backing and runoff tabs, and grind welds smooth.

4. Orient bolt heads on the same side of each connection and maintain orientation consistently from one connection to another.
 5. Remove erection bolts in [Category AESS 4]<Insert category> AESS, fill holes with weld metal or filler, and grind or sand smooth to achieve surface quality approved by Architect.
 6. Fill weld access holes in [Category AESS 4]<Insert category> AESS with weld metal or filler and grind, or sand smooth to achieve surface quality as approved by Architect.
 7. Conceal fabrication and erection markings from view in the completed structure.
- B. In addition to ANSI/AISC 303, Section 10 requirements, comply with the following.
1. Erection of Category AESS 3:
 - a. Erect AESS to the standard frame tolerances specified in ANSI/AISC 303 for non-AESS.
 - b. Comply with AWS D1.1/D1.1M. Keep appearance and quality of welds consistent. Maintain true alignment of members without warp exceeding specified tolerances.
 - c. Remove weld spatter, slivers, and similar surface discontinuities.
 - d. Grind off butt and plug weld projections larger than 1/16 inch.
 - e. Continuous welds are to be of uniform size and profile.
 - f. Ream holes that must be enlarged. Use of drift pins or burning is not permitted. Replace misaligned connection plates where holes cannot be aligned with acceptable appearance.
 - g. Splice members only where indicated on Drawings.
 - h. No torch cutting or field fabrication is permitted.
 - i. Weld profiles, quality, and finish are to be as approved by Architect.
 - j. Make joint welds, including tack welds, appear continuous by filling intermittent welds.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.
1. Joint Type: [Snug tightened][Pretensioned][Slip critical].
- 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.

3.5 REPAIR

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and touchup galvanizing to comply with ASTM A780/A780M.
- B. Touchup Painting:

1. 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.
 - a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
 2. Cleaning and touchup painting are specified in [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]
- C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage][Engage] a qualified testing agency to inspect AESS as specified in Section 051200 "Structural Steel Framing." The testing agency is not responsible for enforcing requirements relating to aesthetic effect.
- B. Architect will observe AESS in place to determine acceptability relating to aesthetic effect.

END OF SECTION 05 12 13

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

B. Related Requirements:

1. Section 03-3000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 05-1200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 05-5000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Roof deck.
2. Composite floor deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of steel deck.

C. Test and Evaluation Reports:

1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - a. Power-actuated mechanical fasteners.
 - b. Acoustical roof deck.
2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

D. Field Quality-Control Submittals:

1. Field quality-control reports.

- E. Qualification Statements: For welding personnel and testing agency.

1.4 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with SDI QA/QC and the following welding codes:
 1. AWS D1.1/D1.1M.
 2. AWS D1.3/D1.3M.
- B. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its "RoofNav" for Class 1 fire rating and Class 1-90 windstorm ratings. Identify materials with FM Approvals Certification markings.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store products in accordance with SDI MOC3. 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck in accordance with AISI S100.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 ROOF DECK

- 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. ASC Steel Deck; ASC Profiles, LLC
 2. Canam Buildings US Inc.; Canam Group Inc.
 3. CSM Metal Deck
 4. Epic Metals Corporation
 5. Marlyn Steel Decks, Inc.
 6. New Millennium Building Systems, LLC

7. Verco Decking, Inc.; a Nucor company
8. Vulcraft Group; Division of Nucor Corp.

- B. Fabrication of Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with SDI RD and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50, G60 zinc coating.
2. Deck Profile: Type WR, wide rib.
3. Profile Depth: 1-1/2 inches.
4. Design Uncoated-Steel Thickness: 0.0358 inch.
5. Span Condition: As indicated.
6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

- 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. ASC Steel Deck; ASC Profiles, LLC
2. Canam Buildings US Inc.; Canam Group Inc.
3. CSM Metal Deck
4. Epic Metals Corporation
5. Marlyn Steel Decks, Inc.
6. New Millennium Building Systems, LLC
7. Verco Decking, Inc.; a Nucor company
8. Vulcraft Group; Division of Nucor Corp.

- B. Fabrication of Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with SDI C, with the minimum section properties indicated, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 50, G60 zinc coating.
2. Profile Depth: 1 1/2 inches.
3. Design Uncoated-Steel Thickness: 0.032 inch.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

- A. 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. 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.

- E. 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 standards for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Shear Stud Connectors: ASTM A108, AISI C-1015 through C-1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.
- I. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.

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 of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories in accordance with SDI C, SDI NC, and SDI RD, as applicable; 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.
- 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 in accordance with deck manufacturer's written instructions.

- J. Shear Stud Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Weld using end welding of headed-stud shear connectors in accordance with AWS D1.1/D1.1M and manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

- 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 12 inches apart in Zone 1 and 6 inches apart in Zones 2 and 3, based on roof-area definitions in FM Global Loss Prevention Data Sheet 1-28.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-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.
- 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 or butted at Contractor's option.
- D. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.
 - 1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.
- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels in accordance with 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.

3.4 INSTALLATION OF FLOOR DECK

- 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: 3/4 inch, nominal.
 - 2. Weld Spacing:
 - a. Weld edge ribs of panels at each support. Space additional welds an average of 16 inches apart, but not more than 18 inches apart.

- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-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.
- 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 or butted at Contractor's option.
- D. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure in accordance with SDI recommendations unless otherwise indicated.
- E. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, in accordance with SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

3.5 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.6 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Tests and Inspections:
 - 1. Special inspections and qualification of welding special inspectors for cold-formed steel floor and roof deck in accordance with quality-assurance inspection requirements of SDI QA/QC.
 - a. Field welds will be subject to inspection.
 - 2. Steel decking will be considered defective if it does not pass tests and inspections.
 - 3. Shear Stud Connectors: In addition to visual inspection, test and inspect field-welded shear connectors in accordance with requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - a. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - b. Conduct tests in accordance with requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors that are already tested.
- C. Prepare test and inspection reports.

END OF SECTION 05 31 00

SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-formed steel framing.
2. Load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Vertical deflection clips, exterior.
5. Interior non-load-bearing wall framing.
6. Vertical deflection clips, interior.
7. Joist framing.
8. Roof-rafter framing.
9. Soffit framing.
10. Sill sealer gasket/termite barrier.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel shapes, masonry shelf angles, and connections used with cold-formed metal framing.
2. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies, with height limitations.
3. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, within height limitations and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to

- adjoining work.
- 3. Signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Delegated Design Submittal: For cold-formed steel framing, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- D. Sustainable Design Submittals:
 - 1. Third-Party Certifications: For each product.
 - 2. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Certificates: For each type of code-compliance certification for studs and track.
- D. Product Test Reports: For each listed product, for tests performed by [manufacturer and witnessed by a qualified testing agency][a qualified testing agency].
 - 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.
- E. Research Reports:
 - 1. For nonstandard cold-formed steel framing [post-installed anchors][and][power-actuated fasteners], from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
 - 2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.
- F. Delegated Design Engineer Qualifications: For cold-formed steel framing.

1.5 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Accredited by International Accreditation Service (IAS) to IAS AC98 criteria for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency[, or in-house testing with calibrated test equipment,] indicating steel sheet complies with requirements, including base-steel thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

- C. Code-Compliance Certification of Studs and Track: Provide documentation that framing members are certified in accordance with the product-certification program of [the Steel Framing Industry Association][the Steel Stud Manufacturers Association][or][the Supreme Steel Framing System Association].
- D. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- E. Comply with AISI S230 for one- and two-family dwellings.
- F. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in [state]<Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer as defined in Section 014000 "Quality Requirements," to design cold-formed steel framing.
- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: [As indicated on Drawings]<Insert design loads>.
 - 2. Deflection Limits: Design framing systems to withstand[design loads] without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of [1/240][1/360][1/600][1/720] of the wall height.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of [1/240][1/360] of the wall height under a horizontal load of 5 lbf/sq. ft..
 - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of [1/240][1/360][1/600][1/720]<Insert ratio> of the wall height.
 - d. Interior Non-Load-Bearing Framing: Horizontal deflection of [1/240][1/360] of the wall height under a horizontal load of 5 lbf/sq. ft..
 - e. Floor Joist Framing: Vertical deflection of [1/360][1/480] for live loads and l/240 for total loads of the span.
 - f. Roof Rafter Framing: Vertical deflection of [1/120][1/240][1/360] of the

- g. horizontally projected span for live loads.
Ceiling Joist Framing: Vertical deflection of $[1/120][1/240][1/360]$ of the span for live loads and $1/240$ for total loads of the span.
- 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope 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 $[1/2 \text{ inch}][3/4 \text{ inch}][1 \text{ inch}][1-1/2 \text{ inches}]$.
- 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and $[ASTM C955][AISI S200 \text{ and } ASTM C955, \text{ Section } 8][AISI S240]$.
- D. Seismic Performance: Cold-formed steel framing to withstand the effects of earthquake motions determined in accordance with $[ASCE/SEI 7 \text{ and } AISI S400]<\text{Insert requirement}>$.
- E. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Product iQ" or from the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- F. Sound-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, in accordance with ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 COLD-FORMED STEEL FRAMING

- A. Manufacturers: Subject to compliance with requirements, $[\text{provide products by the following}][\text{provide products by one of the following}][\text{available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following}]$:
 - 1. $[AllSteel \& \text{ Gypsum Products, Inc.}]$
 - 2. $[CEMCO; \text{ California Expanded Metal Products Co.}]$
 - 3. $[ClarkDietrich]$
 - 4. $[Consolidated Fabricators Corp.; \text{ Building Products Division}]$
 - 5. $[CRACO Mfg., Inc.]$
 - 6. $[\text{Design Shapes in Steel}]$

7. [Formetal Co. Inc. (The)]
8. [Jaimes Industries, Inc.]
9. [MarinoWARE]
10. [MBA Metal Framing]
11. [Mill Steel Framing; Mill Steel Company]
12. [MRI Steel Framing, LLC]
13. [Olmar Supply, Inc]
14. [Quail Run Building Materials, Inc.]
15. [SCAFCO Steel Stud Company; Stone Group of Companies]
16. [State Building Products, Inc]
17. [Steel Construction Systems; Stone Group of Companies]
18. [Steel Network, Inc. (The)]
19. [Steeler, Inc]
20. [Super Stud Building Products Inc.]
21. [TELLING Industries]
22. [The Mill Steel Co]
23. [US Frame Factory]
24. <Insert manufacturer's name>

- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- C. Framing Members, General: Comply with [ASTM C955][AISI S200 and ASTM C955, Section 8][AISI S240] for conditions indicated.
- D. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:
1. Grade: [ST33H][ST50H][As required by structural performance]<Insert grade>.
 2. Coating: [G60, A60, AZ50, or GF30][G90 or equivalent]<Insert coating designation>.
- E. Steel Sheet for Vertical Deflection Drift Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: [33][50, Class 1][As required by structural performance]<Insert grade>.
 2. Coating: G90 <Insert coating designation>.

2.3 LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Flange Width: [1-3/8 inches][1-5/8 inches][2 inches][2-1/2 inches][3 inches][3-1/2 inches]<Insert dimension>.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated,

unpunched, with straight flanges, and as follows:

1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch][Matching steel studs]<Insert dimension>.
 2. Flange Width: [1-1/4 inches][1-1/2 inches]<Insert dimension if manufacturer's standard width is insufficient>.
- C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
1. Minimum Base Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Flange Width: [1-3/8 inches][1-5/8 inches][2 inches][2-1/2 inches]<Insert dimension>.
- D. Steel Single- or Double-L Headers: Manufacturer's standard L-shapes used to form header beams, of web depths indicated, and as follows:
1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Top Flange Width: [1-1/2 inches][1-5/8 inches][2 inches][2-1/2 inches]<Insert dimension>.

2.4 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-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Flange Width: [1-3/8 inches][1-5/8 inches][2 inches][2-1/2 inches]<Insert dimension>.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch][Matching steel studs]<Insert dimension>.
 2. Flange Width: [1-1/4 inches]<Insert dimension if manufacturer's standard width is insufficient>.
- C. Vertical Deflection Clips, Exterior: Manufacturer's standard [bypass][head] clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [AllSteel & Gypsum Products, Inc.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Marino\WARE]
- e. [SCAFCO Steel Stud Company; Stone Group of Companies]
- f. [Simpson Strong-Tie Co., Inc.]
- g. [Steel Construction Systems; Stone Group of Companies]
- h. [Steel Network, Inc. (The)]
- i. <Insert manufacturer's name>

- 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 loads and transfer them to the primary structure, and as follows:

1. Minimum Base-Steel Thickness:
[0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
2. Flange Width: [1 inch plus the design gap for one-story structures][and][1 inch plus twice the design gap for other applications]<Insert dimension>.

- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.5 INTERIOR 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-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
2. Flange Width: [1-3/8 inches][1-5/8 inches][2 inches][2-1/2 inches][3 inches][3-1/2 inches]<Insert dimension>.

- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch][Matching steel studs]<Insert dimension>.
2. Flange Width: [1-1/4 inches][1-1/2 inches][2 inches]<Insert dimension if manufacturer's standard width is insufficient>.

- C. Vertical Deflection Clips, Interior: Manufacturer's standard [bypass][head] clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [AllSteel & Gypsum Products, Inc.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [MarinoWARE]
 - e. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - f. [Simpson Strong-Tie Co., Inc.]
 - g. [Steeler, Inc]
 - h. <Insert manufacturer's name>
- 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 loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Steel Thickness:
[0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Flange Width: [1 inch plus the design gap for one-story structures][and][1 inch plus twice the design gap for other applications]<Insert dimension>.
- E. Drift Clips: Manufacturer's standard bypass or head clips, capable of isolating wall stud from upward and downward vertical displacement and lateral drift of primary structure through positive mechanical attachment to stud web and structure.

2.6 JOIST FRAMING

- A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, [unpunched][punched with standard holes][punched with enlarged service holes] with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
 2. Flange Width: [1-5/8 inches][2 inches][2-1/2 inches][3 inches][3-1/2 inches]<Insert dimension>, minimum.
- B. Steel Rim Joist Track: Manufacturer's standard U-shaped steel rim joist track, of web depths indicated, unpunched or punched at joist spacing, with unstiffened flanges, and as follows:
1. Minimum Base-Metal Thickness:

[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch][Matching steel joists]<Insert dimension>.

2. Flange Width: [1-1/4 inches][1-1/2 inches][2 inches]<Insert dimension>, minimum.

2.7 ROOF-RAFTER FRAMING

- A. Steel Rafters: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Steel Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
2. Flange Width: [1-5/8 inches][2 inches][2-1/2 inches][3 inches][3-1/2 inches]<Insert dimension>, minimum.

2.8 SOFFIT FRAMING

- A. Exterior Soffit Framing: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness:
[0.0329 inch][0.0428 inch][0.0538 inch][0.0677 inch][0.0966 inch][0.1180 inch]<Insert dimension>.
2. Flange Width: [1-5/8 inches][2 inches][2-1/2 inches][3 inches][3-1/2 inches]<Insert dimension>, minimum.

2.9 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic-coated steel sheet, of same grade and coating designation used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
 1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole-reinforcing plates.
 11. Backer plates.

2.10 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process in accordance with ASTM A123/A123M.
- B. Anchor Bolts: ASTM F1554, [Grade 36][Grade 55], threaded carbon-steel [hex-headed bolts][headless, hooked bolts][headless bolts, with encased end threaded] carbon-steel nuts, and flat, hardened-steel washers; zinc coated by [hot-dip process in accordance with ASTM A153/A153M, Class C][mechanically deposition according to ASTM B695, Class 50].
- C. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on [ICC-ES AC01][ICC-ES AC193][ICC-ES AC58][or][ICC-ES AC308] as appropriate for the substrate.
 - 1. Uses: Securing cold-formed steel framing to structure.
 - 2. Type: [Torque-controlled expansion anchor][Torque-controlled adhesive anchor][or][adhesive anchor].
 - 3. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/ASTM F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 4. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- D. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.11 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: [ASTM A780/A780M][MIL-P-21035B][or][SSPC-Paint 20].
- B. Cement Grout: Portland cement, ASTM C476, Type I; and clean, natural sand, ASTM C404. 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: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C1107/C1107M, and with a fluid consistency and 30-minute working time.

- D. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.
- E. Sill Sealer Gasket: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members as required.
- F. Sill Sealer Gasket/Termite Barrier: Minimum 68-mil nominal thickness, self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on adhesive side[; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction].
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Polyguard Products, Inc.]
 - b. <Insert manufacturer's name>
 - 2. Physical Properties:
 - a. Peel Adhesion: 17.0 lb/in of width when tested in accordance with ASTM D412.
 - b. Low-Temperature Flexibility: Pass at minus 25 deg F when tested in accordance with ASTM D146/D146M.
 - c. Water Vapor Permeance: 0.05 perm maximum when tested in accordance with ASTM E96/E96M, Method B.
 - d. Resistance to Termite Penetration: Comply with ICC-ES AC380.

2.12 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, in accordance with AISI S240 and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install in accordance with Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, in accordance with Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.
- C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 ft. and as follows:
 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative errors are not to exceed minimum fastening requirements of sheathing or other finishing materials.
 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, conditions, and abutting structural framing 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. Before sprayed fire-resistive materials are applied, attach continuous angles, supplementary framing, or track 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 ratings indicated. Protect remaining fire-resistive materials from damage.
- C. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.
- D. Install sill sealer gasket at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- E. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION OF COLD-FORMED STEEL FRAMING

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing in accordance with ASTM C1007, AISI S202, and 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 steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners, install in accordance with Shop Drawings, and comply 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 equal 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 joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in framing-assembly 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 approved or standard punched openings.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

- A. Install continuous top and bottom track sized to match studs. Align track accurately and

securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: [As shown on Shop Drawings]<Insert dimension>.
- B. Squarely seat studs against top and bottom track, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.
 1. Fasten both flanges of studs to top and bottom track.
 2. Space studs as follows:
 - a. Stud Spacing: [12 inches][16 inches][19.2 inches][24 inches][As indicated on Shop Drawings]<Insert dimension>.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs in accordance with AISI S240, Section C3.5.2. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 2. Install track and jack studs above and below wall openings. Anchor track to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.
 1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.
- I. Install horizontal bridging in stud system, spaced vertically [48 inches][as indicated on Drawings][as indicated on Shop Drawings]<Insert dimension>. Fasten at each stud intersection.
 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip

- angle for framing members up to 6 inches deep.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges, and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed in accordance with manufacturer's written instructions.
- J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom track. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.
- K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Install continuous track sized to match studs. Align track accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to [top and] bottom track unless otherwise indicated. Space studs as follows:
- 1. Stud Spacing: [12 inches][16 inches][19.2 inches][24 inches][As indicated on Shop Drawings]<Insert dimension>.
- 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 deep-leg deflection track and anchor to building structure.
 - 2. Connect vertical deflection clips to [bypassing][infill] studs and anchor to building structure.
 - 3. Connect drift clips to cold-formed steel framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated [on Shop Drawings] but not more than 48 inches apart. Fasten at each stud intersection.
- 1. Channel Bridging: Cold-rolled steel U-channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within [12 inches][18 inches] of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.
 - 1. Install solid blocking at [96-inch centers][centers indicated][centers indicated on Shop Drawings].
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.6 INSTALLATION OF INTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Install continuous track sized to match studs. Align track accurately and securely anchor to supporting structure.
- B. Fasten both flanges of studs to[top and] bottom track unless otherwise indicated. Space studs as follows:
 - 1. Stud Spacing: [12 inches][16 inches][19.2 inches][24 inches][As indicated on Drawings]<Insert dimension>.
- 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 deep-leg deflection track and anchor to building structure.
 - 2. Connect vertical deflection clips to studs and anchor to building structure.
 - 3. Connect drift clips to cold-formed steel metal framing and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated[on Shop Drawings] but not more than 48 inches apart. Fasten at each stud intersection.
 - 1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 - 2. Strap Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - 3. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- F. Top Bridging for Single Deflection Track: Install row of horizontal bridging within [12 inches][18 inches] of single deflection track. Install a combination of bridging and stud or stud-track solid blocking of width and thickness matching studs, secured to stud webs or flanges.

1. Install solid blocking at [96-inch centers][centers indicated][centers indicated on Shop Drawings].
- G. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.7 INSTALLATION OF JOIST FRAMING

- A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated[on Shop Drawings].
- B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.
 1. Install joists over supporting frame with a minimum end bearing as indicated on Shop Drawings.
 2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.
- C. Space joists not more than 2 inches from abutting walls, and as follows:
 1. Joist Spacing: [12 inches][16 inches][19.2 inches][24 inches][As indicated on Drawings]<Insert dimension>.
- D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.
- E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.
 1. Install web stiffeners to transfer axial loads of walls above.
- F. Install bridging at intervals indicated[on Shop Drawings]. Fasten bridging at each joist intersection as follows:
 1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
 2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.
- G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.
- H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to

provide a complete and stable joist-framing assembly.

3.8 INSTALLATION TOLERANCES

- A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 ft. and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.9 REPAIR

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint in accordance with ASTM A780/A780M and manufacturer's written instructions.

3.10 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. Cold-formed steel framing will be considered defective if it does not pass tests and inspections.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.11 PROTECTION

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

END OF SECTION 05 40 00

SECTION 05 50 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Miscellaneous framing and supports.
2. Shelf angles.
3. Metal floor plate.
4. Elevator pit sump covers.
5. Structural-steel door frames.
6. Miscellaneous steel trim.
7. Pipe and downspout guards.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
3. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.

C. Related Requirements:

1. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
2. Section 051200 "Structural Steel Framing" for steel framing, supports, elevator machine beams, hoist beams, divider beams, door frames, and other steel items attached to the structural-steel framing.
3. Section 077200 "Roof Accessories" for manufactured metal roof walkways and metal roof stairs.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data:

1. Nonslip aggregates and nonslip-aggregate surface finishes.
2. Fasteners.
3. Shop primers.
4. Shrinkage-resisting grout.
5. Prefabricated building columns.
6. Slotted channel framing.
7. Abrasive metal nosings, treads, and thresholds.

B. Shop Drawings: Show fabrication and installation details.[Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.] Provide Shop Drawings for the following:

1. Miscellaneous framing and supports for applications where framing and supports are not specified in other Sections.
2. Elevator machine beams, hoist beams, and divider beams.
3. Steel shapes for supporting elevator door sills.
4. Shelf angles.
5. Metal floor plate and supports.
6. Elevator pit sump covers.
7. Miscellaneous steel trim including [steel angle corner guards][steel edgings][and][loading-dock edge angles].
8. Loose steel lintels.

C. Samples for Verification: For each type and finish of extruded [nosing][and][tread].

D. Delegated Design Submittals: For steel stairs, handrails including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Sustainable Design Submittals:

1. Environmental product declaration.
2. Third-Party Certifications: For each product.
3. Third-Party Certified Life Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

A. Mill Certificates: Signed by stainless steel manufacturers, certifying that products furnished comply with requirements.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

D. Research Reports: For post-installed anchors.

- E. Delegated design engineer qualifications.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design metal pan stairs.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature change>.

2.2 FASTENERS

- A. General: Unless otherwise indicated, provide [Type 304][Type 316] stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.
 - 1. Provide stainless steel fasteners for fastening [aluminum][stainless steel][or][nickel silver].
 - 2. Provide bronze fasteners for fastening bronze.
- B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. High-Strength Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

- D. Stainless Steel Bolts and Nuts: Regular hexagon-head annealed stainless steel bolts, ASTM F593; with hex nuts, ASTM F594; and, where indicated, flat washers; Alloy [Group 1][Group 2].
- E. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- F. Anchors, General: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing in accordance with ASTM E488/E488M, conducted by a qualified independent testing agency.
- G. Cast-in-Place Anchors in Concrete: Either threaded or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A47/A47M malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F2329/F2329M.
- H. Post-Installed Anchors: [Torque-controlled expansion anchors][or][chemical anchors].
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 - 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.3 MISCELLANEOUS MATERIALS

- A. Shop Primers: Provide primers that comply with [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer that contains pigments that make it easily distinguishable from zinc-rich primer.
- C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

- D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Shrinkage-Resistant Grout: Factory-packaged, nonmetallic, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained concrete with a minimum 28-day compressive strength of 3000 psi.

2.4 FABRICATION, GENERAL

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

- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.

2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
 - 1. Fabricate units from slotted channel framing where indicated.
 - 2. Furnish inserts for units installed after concrete is placed.
- C. Fabricate supports for operable partitions from continuous steel beams of sizes [indicated][recommended by partition manufacturer] with attached bearing plates, anchors, and braces as [indicated][recommended by partition manufacturer]. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.
- D. Fabricate steel girders for wood frame construction from continuous steel shapes of sizes indicated.
 - 1. Provide bearing plates welded to beams where indicated.
 - 2. Drill or punch girders and plates for field-bolted connections where indicated.
 - 3. Where wood nailers are attached to girders with bolts or lag screws, drill or punch holes at 24 inches o.c.
- E. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
 - 1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
 - 2. Unless otherwise indicated, provide 1/2-inch baseplates with four 5/8-inch anchor bolts and 1/4-inch top plates.

- F. Galvanize miscellaneous framing and supports where indicated.
- G. Prime miscellaneous framing and supports with [zinc-rich primer][primer specified in Section 099600 "High-Performance Coatings"] where indicated.

2.6 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
 - 1. Provide mitered and welded units at corners.
 - 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize[and prime] shelf angles located in exterior walls.
- D. Prime shelf angles located in exterior walls with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]
- E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.7 METAL FLOOR PLATE

- A. Fabricate from [rolled-steel floor][rolled-stainless steel floor][rolled-aluminum-alloy tread][abrasive-surface floor] plate of thickness indicated below:
 - 1. Thickness: [1/8 inch][3/16 inch][1/4 inch][5/16 inch][3/8 inch][As indicated].
- B. Provide grating sections where indicated, fabricated from [welded or pressure-locked steel bar][pressure-locked stainless steel bar][pressure-locked aluminum bar][extruded-aluminum plank] grating. Limit openings in gratings to no more than [1/2 inch][3/4 inch][1 inch] in least dimension.
- C. Provide [steel][stainless steel][aluminum] angle supports as indicated.
- D. Include [steel][stainless steel][aluminum] angle stiffeners, and fixed and removable sections as indicated.
- E. Provide flush [steel][stainless steel][aluminum] bar drop handles for lifting removable sections, one at each end of each section.

2.8 ELEVATOR PIT SUMP COVERS

- A. Fabricate from [1/8-inch][3/16-inch][rolled-steel][abrasive-surface] floor plate with four

1-inch- diameter holes for water drainage and for lifting.

- B. Fabricate from welded or pressure-locked steel bar grating. Limit openings in gratings to no more than [1/2 inch][3/4 inch][1 inch] in least dimension.
- C. Provide steel angle supports unless otherwise indicated.

2.9 MISCELLANEOUS STEEL TRIM

- A. Unless otherwise indicated, fabricate units from 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.
 - 1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.
- C. Galvanize[and prime][exterior]miscellaneous steel trim.
- D. Prime [exterior]miscellaneous steel trim with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]

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 bearing and leveling plates.
- C. Prime plates with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]

2.11 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to one-twelfth of clear span, but not less than 8 inches unless otherwise indicated.
- C. Galvanize[and prime] loose steel lintels located in exterior walls.
- D. Prime loose steel lintels located in exterior walls with [zinc-rich primer.][primer specified in Section 099600 "High-Performance Coatings."]

2.12 STEEL WELD PLATES AND ANGLES

- A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.13 GENERAL FINISH REQUIREMENTS

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.14 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean galvanized surfaces of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items[not indicated to be galvanized] unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with [universal shop primer][primers specified in Section 099113 "Exterior Painting"] [primers specified in Section 099123 "Interior Painting"] unless [zinc-rich primer is][primers specified in Section 099600 "High-Performance Coatings" are] indicated.
- D. Preparation for Shop Priming: Prepare surfaces to comply with [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."][SSPC-SP 3, "Power Tool Cleaning."][requirements indicated below:]
 - 1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 4. Other Steel Items: SSPC-SP 3, "Power Tool Cleaning."
 - 5. Galvanized-Steel Items: SSPC-SP 16, "Brush-off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals."

- E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.15 ALUMINUM FINISHES

- A. As-Fabricated Finish: AA-M12.
- B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:
 - 1. Cast Aluminum: Heavy coat of bituminous paint.
 - 2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLATION OF 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.
- B. Anchor supports for [ceiling-hung toilet partitions][operable partitions][overhead doors][and][overhead grilles] securely to, and rigidly brace from, building structure.
- C. Anchor shelf angles securely to existing construction with [expansion anchors][anchor bolts][through bolts].
- D. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.
 - 1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.
- E. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installation of Bearing and Leveling Plates" Article.
 - 1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLATION OF SHELF ANGLES

- A. Install shelf angles as required to keep masonry level, at correct elevation, and flush with vertical plane.

3.4 INSTALLATION OF METAL FLOOR PLATE

- A. Install metal floor plates flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.5 INSTALLATION OF ELEVATOR PIT SUMP COVERS

- A. Install tops of elevator sump pit cover plates and frames flush with finished surface. Adjust as required to avoid lippage that could present a tripping hazard.

3.6 INSTALLATION OF MISCELLANEOUS STEEL TRIM

- A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.7 INSTALLATION OF LOOSE 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 shrinkage-resistant grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.8 REPAIRS

- A. Touchup Painting:
 - 1. Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
 - 2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."]
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 50 00

SECTION 05 51 13 - METAL PAN STAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Preassembled steel stairs with [concrete-filled][precast concrete][precast terrazzo][epoxy-resin-filled][and][abrasive-coating-finished, formed-metal] treads.
2. [Steel tube]railings and guards attached to metal stairs.
3. [Steel tube]handrails attached to walls adjacent to metal stairs.
4. Railing gates at the level of exit discharge.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs[, railings, and guards].
 1. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts,[blocking for attachment of wall-mounted handrails,] and items with integral anchors, that are to be embedded in concrete or masonry.
 2. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so they do not encroach on required stair width and are within fire-resistance-rated stair enclosure.
- D. Schedule installation of railings and guards so wall attachments are made only to completed walls.
 1. Do not support railings and guards temporarily by any means that do not satisfy structural performance requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For metal pan stairs and the following:

1. Perforated metal.
2. Woven-wire mesh.
3. Welded-wire mesh.
4. Prefilled metal-pan-stair treads.
5. Abrasive nosings.
6. Shop primer products.

7. Nonslip-aggregate concrete finish.
8. Abrasive-coating finish to formed-metal stairs.
9. Precast concrete treads.
10. Precast terrazzo treads.
11. Epoxy-resin-filled stair treads.
12. Handrail wall brackets.
13. Grout.

B. Sustainable Design Submittals:

1. Environmental product declaration.
2. Third-Party Certifications: For each product.
3. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
3. Include plan at each level.
4. Indicate locations of anchors, weld plates, and blocking for attachment of wall-mounted handrails.
5. Indicate profile and dimensions of precast terrazzo treads.
6. Indicate profile and dimensions of epoxy-resin-filled treads.

D. Samples for Verification: For each type and finish of [nosing][precast terrazzo tread][epoxy-resin-filled tread].

E. Delegated Design Submittal: For stairs, [railings and guards,][precast terrazzo treads,][epoxy-resin-filled treads], including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that engineer is licensed in the [jurisdiction][State] in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

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

2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
 1. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 2. Protect steel members and packaged materials from corrosion and deterioration.
 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs, [railings and guards,][precast terrazzo treads,][epoxy-resin-filled treads], including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Uniform Load: 100 lbf/sq. ft..
 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 3. Uniform and concentrated loads need not be assumed to act concurrently.
 4. Stair Framing: Capable of withstanding stresses resulting from railing and guard loads in addition to loads specified above.
 5. Limit deflection of treads, platforms, and framing members to $[L/360]$ <Insert deflection ratio> or 1/4 inch, whichever is less.
- C. Structural Performance of Railings and Guards: Railings and guards, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
 3. Thermal Movements: Allow for thermal movements from ambient and surface

temperature changes.

- a. Temperature Change: [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature change>.
- D. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.
 - 1. Component Importance Factor: <Insert requirement>.

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing for Railings and Guards: [ASTM A500/A500M (cold formed)][or][ASTM A513/A513M].
 - 1. Provide galvanized finish for exterior installations and where indicated.
- D. Steel Pipe for Railings and Guards: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
 - 2. Provide galvanized finish for exterior installations and where indicated.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M,[either commercial steel, Type B, or] structural steel, Grade 25, unless another grade is required by design loads; exposed.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M,[either commercial steel, Type B, or] structural steel, Grade 30, unless another grade is required by design loads.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- G. Galvanized Steel Sheet: ASTM A653/A653M, G90 coating,[either commercial steel, Type B, or] structural steel, Grade 33, unless another grade is required by design loads.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.

- H. Expanded-Metal, Carbon Steel: ASTM F1267, [Type I (expanded)][Type II (expanded and flattened)], Class 1 (uncoated).
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
 2. Style Designation: [3/4 number 13][1-1/2 number 10]<Insert designation>.
- I. Perforated Metal, Uncoated: Cold-rolled steel sheet, ASTM A1008/A1008M, or hot-rolled steel sheet, ASTM A1011/A1011M, commercial steel Type B, [0.060 inch]<Insert dimension> thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows][with 1/8-by-1-inch round end slotted holes in staggered rows]<Insert description>.
- J. Perforated Metal, Galvanized Steel Sheet: ASTM A653/A653M, G90 coating, commercial steel Type B, [0.064 inch]<Insert dimension> thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows]<Insert description>.
- K. Perforated Metal, Aluminum Sheet: ASTM B209, [0.125 inch][0.063 inch]<Insert dimension> thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows]<Insert description>.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- L. Woven-Wire Mesh, Steel: Intermediate-crimp, [diamond][square] pattern, 2-inch woven-wire mesh, made from 0.135-inch nominal-diameter steel wire complying with ASTM A510/A510M.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- M. Woven-Wire Mesh, Aluminum: Intermediate-crimp, [diamond][square] pattern, 2-inch woven-wire mesh, made from 0.162-inch- diameter, aluminum wire complying with ASTM B211, Alloy 6061-T94.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- N. Welded-Wire Mesh: [Diamond][Square] pattern, 2-inch welded-wire mesh, made from 0.236-inch nominal-diameter steel wire complying with ASTM A510/A510M.
- O. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- P. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
1. Recycled Content of Aluminum Components: Postconsumer recycled content

plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.

Q. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

R. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (lead red brass) or No. C84400 (lead semired brass).

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

S. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent lead nickel bronze).

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

T. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.

1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

2.3 ABRASIVE NOSINGS

A. Extruded Units: [Aluminum][Bronze] units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Safety Tread Co., Inc]
- b. [Amstep Products]
- c. [Armstrong Products, Inc]
- d. [Balco; a CSW Industrials Company]
- e. [Ecoglo, Inc.]
- f. [Granite State Casting Co]
- g. [Nystrom, Inc.]
- h. [UPNOVR, Inc.]
- i. [Wooster Products Inc]
- j. <Insert manufacturer's name>

2. Recycled Content: Postconsumer recycled content plus one-half of preconsumer

- recycled content not less than <Insert value> percent.
3. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 4. Provide solid-abrasive units without ribs.
 5. Nosings, Square-Back Units: [1-7/8 inches][3 inches][4 inches] wide, without lip.
 6. Nosings, Two-Piece Units: 3 inches wide, with subchannel for casting into concrete.
- B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.
- C. Apply bituminous paint to concealed surfaces of cast-metal units set into concrete.
- D. Apply clear lacquer to concealed surfaces of extruded units set into concrete.

2.4 FASTENERS

- A. General: Provide [zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5][Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5] where built into exterior walls.
1. Select fasteners for type, grade, and class required.
- B. Fasteners for Anchoring Railings and Guards to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings and guards to other types of construction indicated[and capable of withstanding design loads].
- C. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- D. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for [exterior stairs][stairs indicated to be galvanized][stairs indicated to be shop primed with zinc-rich primer].
- E. Post-Installed Anchors: [Torque-controlled expansion anchors][or][chemical anchors] capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy

[Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Wall Brackets: [Cast nickel-silver,][Cast aluminum,][Cast bronze,][Cast stainless steel,] center of rail [2-1/2 inches][3-1/8 inches]<Insert dimension> from face of wall.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Julius Blum & Co., Inc.]
 - b. [The Wagner Companies]
 - c. <Insert manufacturer's name>
- B. Welding Electrodes: Comply with AWS requirements.
- C. Shop Primers: Provide primers that comply with [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]
- D. Universal Shop Primer: 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.
- E. Zinc-Rich Primer: Comply with SSPC-Paint 20, [Type I-A][Type I-B][Type I-C][Type II], Level [1][2][3], and compatible with topcoat.
- F. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish system indicated.
- G. Galvanizing Repair Paint: High-zinc-dust-content paint complying with [SSPC-Paint 20][ASTM A780/A780M] and compatible with paints specified to be used over it.
- H. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- I. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout; recommended by manufacturer for [interior][exterior] use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.
- J. Prefilled Concrete Treads:
 - 1. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete

with minimum 28-day compressive strength of 3000 psi and maximum aggregate size of 1/2 inch unless otherwise indicated.

2. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
 3. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, [steel,][galvanized steel,] 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated on Drawings.
 - a. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
 4. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening welded-wire reinforcement in place.
 - a. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
- K. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.6 PRECAST CONCRETE TREADS

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.
- B. Reinforcement: Galvanized, welded-wire reinforcement, 2 by 2 inches by 0.062-inch-diameter steel wire; comply with ASTM A1064/A1064M, except for minimum wire size.

2.7 EPOXY-RESIN-FILLED TREADS

- A. Epoxy-Resin-Filled Treads: 3/8-inch- thick, epoxy resin with 8000-psi compressive strength; set on steel subtread.
 1. Color: As selected by Architect from manufacturer's standard color selections.

2.8 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts,[railings and guards,] 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.

- B. Assemble stairs[, railings, and guards] in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- 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 to comply with NOMMA's "Voluntary Joint Finish Standards" for [Finish #1 - No evidence of welded joint][Finish #2 - Completely sanded joint with some undercutting and pinholes okay][Finish # 3 - Partially dressed weld with spatter removed][Finish # 4 - Good quality, uniform undressed weld with minimal splatter].
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible.
 - 1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
 - 2. Locate joints where least conspicuous.
 - 3. Fabricate joints that will be exposed to weather in a manner to exclude water.
 - 4. Provide weep holes where water may accumulate internally.

2.9 FABRICATION OF STEEL-FRAMED STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for [Architectural][Commercial][Service] Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 - 1. Stringers: Fabricate of [steel plates][or][steel channels][or][steel rectangular tubes][as indicated on Drawings].
 - a. Stringer Size: [As required to comply with "Performance Requirements"]

- Article][As indicated on Drawings].
- b. Provide closures for exposed ends of channel and rectangular tube stringers.
 - c. Finish: [Shop primed][Painted][Galvanized].
2. Platforms: Construct of [steel plate][or][steel channel][or][steel rectangular tube] headers and miscellaneous framing members as [required to comply with "Performance Requirements" Article][indicated on Drawings].
- a. Provide closures for exposed ends of channel and rectangular tube framing.
 - b. Finish: [Shop primed][Painted][Galvanized].
3. Weld[or bolt] stringers to headers; weld[or bolt] framing members to stringers and headers.[If using bolts, fabricate and join so bolts are not exposed on finished surfaces.]
4. Where stairs are enclosed by gypsum board[shaft-wall] assemblies, provide hanger rods or struts to support landings from floor construction above or below.
- a. Locate hanger rods and struts where they do not encroach on required stair width and are within the fire-resistance-rated stair enclosure.
5. Where masonry walls support metal stairs, provide temporary supporting struts designed for erecting steel stair components before installing masonry.
- C. Metal Pan Stairs: Form risers, subtread pans, and subplatforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.067 inch.
- 1. Fabricate treads and landing subplatforms of exterior stairs so finished walking surfaces slope to drain.
 - 2. Steel Sheet, Uncoated: [Cold][Hot]-rolled steel sheet[unless otherwise indicated].
 - 3. Galvanized Steel Sheet: Galvanized steel sheet[, where indicated].
 - 4. Directly weld metal pans to stringers; locate welds on top of subtreads where they will be concealed by concrete fill. Do not weld risers to stringers.
 - 5. Attach risers and subtreads to stringers with brackets made of steel angles or bars. Weld brackets to stringers and attach metal pans to brackets by welding, riveting, or bolting.
 - 6. Shape metal pans to include nosing integral with riser.
 - 7. Attach abrasive nosings to risers.
 - 8. At Contractor's option, provide stair assemblies with metal pan subtreads filled with reinforced concrete during fabrication.
 - 9. Provide epoxy-resin-filled treads, reinforced with glass fibers, with non-slip-concrete aggregate finish to tread surface.
 - 10. 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 flat metal under surfaces to produce smooth soffits.

- D. Abrasive-Coating-Finished, Formed-Metal Stairs: Form risers, treads, and platforms to configurations shown from steel sheet of thickness needed to comply with performance requirements, but not less than 0.097 inch.

1. Steel Sheet: Uncoated, hot-rolled steel sheet unless otherwise indicated.
2. Directly weld risers and treads to stringers; locate welds on underside of stairs.
3. Provide platforms of configuration indicated or, if not indicated, the same as treads. Weld platforms to platform framing.
4. Finish tread and platform surfaces with manufacturer's standard epoxy-bonded abrasive finish.

2.10 FABRICATION OF STAIR RAILINGS AND GUARDS

- A. Comply with applicable requirements in [Section 055213 "Pipe and Tube Railings."][Section 057300 "Decorative Metal Railings."]

- B. Fabricate railings and guards to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of member, post spacings, wall bracket spacing, and anchorage, but not less than that needed to withstand indicated loads.

1. Rails and Posts: [1-5/8-inch- diameter][1-1/2-inch- square] top and bottom rails and 1-1/2-inch- square posts.
2. Picket Infill: [1/2-inch-][3/4-inch-][round][square] pickets spaced to prohibit the passage of a 4-inch diameter sphere.
3. Expanded-Metal Infill: Expanded-metal panels edged with U-shaped channels made from steel sheet and not less than 0.043 inch thick. Orient expanded metal with long dimension of diamonds [parallel to top rail][perpendicular to top rail][vertical].
4. Perforated-Metal Infill: Perforated-metal panels edged with U-shaped channels made from metal sheet, of same metal as perforated metal, and not less than 0.043 inch thick. Orient perforated metal with pattern [parallel to top rail][perpendicular to top rail][horizontal][vertical][as indicated on Drawings].
5. Mesh Infill: [Woven][Welded]-wire mesh crimped into 1-by-1/2-by-1/8-inch steel channel frames. Orient wire mesh with [diamonds vertical][wires perpendicular and parallel to top rail][wires horizontal and vertical].
6. Intermediate Rails Infill: [1-5/8-inch- diameter][1-1/2-inch- square] intermediate rails spaced less than [12 inches][21 inches] clear.
7. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with [cam-type, self-closing][spring] hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.

- C. Welded Connections: Fabricate railings and guards with welded connections.

1. Fabricate connections that are exposed to weather in a manner that excludes water.
 - a. Provide weep holes where water may accumulate internally.

2. Cope components at connections to provide close fit, or use fittings designed for this purpose.
 3. Weld all around at connections, including at fittings.
 4. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 5. Obtain fusion without undercut or overlap.
 6. Remove flux immediately.
 7. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for [Finish #1 - No evidence of a welded joint][Finish #2 - Completely sanded joint, some undercutting and pinholes are okay][Finish #3 - Partially dressed weld with spatter removed][Finish #4 - Good quality, uniform undressed weld with minimal splatter] as shown in NAAMM AMP 521.
- D. Form changes in direction of railings and guards as follows:
1. As detailed.
 2. By bending[or by inserting prefabricated elbow fittings].
 3. By flush bends[or by inserting prefabricated flush-elbow fittings].
 4. By radius bends of radius indicated[or by inserting prefabricated elbow fittings of radius indicated].
 5. By inserting prefabricated [elbow fittings][flush-elbow fittings][elbow fittings of radius indicated].
- E. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- F. Close exposed ends of railing and guard members with prefabricated end fittings.
- G. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated.
1. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- H. Connect posts to stair framing by direct welding unless otherwise indicated.
- I. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
1. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 2. For galvanized railings and guards, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 3. For nongalvanized railings and guards, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
 4. Provide type of bracket [with flange tapped for concealed anchorage to threaded hanger bolt][with predrilled hole for exposed bolt anchorage] and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

- J. 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.
 - 1. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.11 FINISHES

- A. Finish metal stairs after assembly.
- B. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Preparation for Shop Priming: Prepare uncoated, ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
 - 1. For wall-mounted railings, verify locations of concealed reinforcement within gypsum board and plaster assemblies.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF METAL PAN STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal stairs to in-place construction.
 - 1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for

installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.

- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 - 1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
 - a. Clean bottom surface of plates.
 - b. Set plates for structural members on wedges, shims, or setting nuts.
 - c. Tighten anchor bolts after supported members have been positioned and plumbed.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- E. Fit exposed connections accurately together to form hairline joints.
 - 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 - 2. 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.
 - 3. Comply with requirements for welding in "Fabrication, General" Article.
- F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
 - 1. Install abrasive nosings with anchors fully embedded in concrete.
 - 2. Center nosings on tread width.
- G. Install precast concrete treads with adhesive supplied by manufacturer.
- H. Install precast terrazzo treads according to manufacturer's written instructions.

3.3 INSTALLATION OF RAILINGS AND GUARDS

- A. Adjust railing and guard systems before anchoring to ensure matching alignment at abutting joints with tight, hairline joints.
 - 1. Space posts at spacing indicated or, if not indicated, as required by design loads.
 - 2. Plumb posts in each direction, within a tolerance of 1/16 inch in 3 feet.

3. Align rails and guards so variations from level for horizontal members and variations from parallel with rake of stairs for sloping members do not exceed 1/4 inch in 12 feet.
4. Secure posts, rail ends, and guard ends to building construction as follows:
 - a. Anchor posts to steel by [welding][or][bolting] to steel supporting members.
 - b. Anchor handrail and guard ends to concrete and masonry with steel round flanges welded to rail and guard ends and anchored with post-installed anchors and bolts.

B. Install railing gates level, plumb, and secure for full opening without interference.

1. Attach hardware using tamper-resistant or concealed means.
2. Adjust hardware for smooth operation.

C. Attach handrails to wall with wall brackets.

1. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
2. Secure wall brackets to building construction as[required to comply with performance requirements.][follows:]
 - a. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 - b. For hollow masonry anchorage, use toggle bolts.
 - c. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
 - d. For steel-framed partitions, use hanger or lag bolts set into [fire-retardant-treated]wood backing between studs. Coordinate with stud installation to locate backing members.
 - e. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - f. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.4 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior

Painting," and Section 099600 "High-Performance Coatings."]

- B. Repair of Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 51 13

SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel railings.

B. Related Requirements:

1. Section 055113 "Metal Pan Stairs" for steel tube railings associated with metal pan stairs.
2. Section 057300 "Decorative Metal Railings" for ornamental railings fabricated from pipes and tubes and guard-infill metals.
3. Section 096900 "Access Flooring" for railings included with access flooring.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines of mechanically connected railings.
2. Expanded metal infill panels.
3. Perforated metal infill panels.
4. Woven-wire mesh infill panels.
5. Fasteners.
6. Post-installed anchors.
7. Handrail brackets.
8. Shop primer.
9. Intermediate coats and topcoats.
10. Bituminous paint.
11. Nonshrink, nonmetallic grout.
12. Anchoring cement.
13. Metal finishes.
14. Paint products.

- B. Sustainable Design Submittals:
- C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- 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.
 - 1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters, including finish.
 - 2. Fittings and brackets.
 - 3. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of [connecting][and][finishing] members at intersections.
- F. Delegated Design Submittal: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [delegated design professional engineer][testing agency].
- B. Welding certificates.
- C. Mill Certificates: Signed by manufacturers of stainless steel products, certifying that products furnished comply with requirements.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- E. Product Test Reports: For tests on railings performed by a qualified testing agency, in accordance with ASTM E894 and ASTM E935.
- F. Research Reports: For post-installed anchors, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces of railings from damage by applying a strippable, temporary protective covering before shipping.

1.7 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design railings, including attachment to building construction.
- B. Structural Performance: Railings, including attachment to building construction, withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature change>.

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.
 - 1. Provide type of bracket with [flange tapped for concealed anchorage to threaded

hanger bolt][predrilled hole for exposed bolt anchorage] and that provides 1-1/2-inch clearance from inside face of handrail to finished wall surface.

2.3 STEEL RAILINGS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Hollaender Mfg. Co.]
 2. [Kee Safety, Inc.]
 3. [Trex Commercial Products, Inc.]
 4. [TrueNorth Steel]
 5. [Tuttle, a Dant Clayton Division]
 6. [VIVA Railings, LLC]
 7. [Wagner Companies (The); R&B Wagner, Inc.]
 8. <Insert manufacturer's name>
- B. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- D. Tubing: [ASTM A500/A500M (cold formed)][or][ASTM A513/A513M, Type 5].
- E. Pipe: ASTM A53/A53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
1. Provide galvanized finish for exterior installations and where indicated.
- F. Plates, Shapes, and Bars: ASTM A36/A36M.
- G. Cast Iron Fittings: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
- H. Expanded Metal Infill Panels: ASTM F1267, [Type I (expanded)][Type II (expanded and flattened)], Class 1 (uncoated).
1. Style Designation: [3/4 number 13][1-1/2 number 10]<Insert designation>.
- I. Perforated-Metal Infill Panels:
1. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, or hot-rolled steel sheet, ASTM A1011/A1011M, commercial steel, Type B, [0.060 inch]<Insert dimension> thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows]<Insert description>.
 - a. Basis-of-Design Product: Provide product with perforations matching [product indicated on Drawings]<Insert manufacturer's name; product name or designation>.

2. Galvanized-Steel Sheet: ASTM A653/A653M, G90 coating, commercial steel Type B, [0.064 inch]<Insert dimension> thick, [with 1/4-inch holes 3/8 inch o.c. in staggered rows][with 1/8-by-1-inch round end slotted holes in staggered rows]<Insert description>.
 - a. Basis-of-Design Product: Provide product with perforations matching [product indicated on Drawings]<Insert manufacturer's name; product name or designation>.
- J. Woven-Wire Mesh Infill Panels: Intermediate-crimp, [diamond][square] pattern, 2-inch woven-wire mesh, made from 0.134-inch- diameter steel wire complying with ASTM A510.
 1. Basis-of-Design Product: Provide product with crimp pattern matching [product indicated on Drawings]<Insert manufacturer's name; product name or designation>.

2.4 FASTENERS

- A. Fastener Materials:
 1. Ungalvanized-Steel Railing Components: Plated steel fasteners complying with ASTM F1941/F1941M, Class Fe/Zn 5 for zinc coating.
 2. Hot-Dip Galvanized Railing Components: Type 304 stainless steel or hot-dip zinc-coated steel fasteners complying with ASTM A153/A153M or ASTM F2329/F2329M for zinc coating.
 3. Aluminum Railing Components: [Type 304][Type 316] stainless steel fasteners.
 4. Stainless Steel Railing Components: [Type 304][Type 316] stainless steel fasteners.
 5. Finish exposed fasteners to match appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction[and capable of withstanding design loads].
- C. Fasteners for Interconnecting Railing Components:
 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 3. Provide [Phillips][tamper-resistant][square or hex socket] flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC193[or ICC-ES AC308].

1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Handrail Brackets: [Cast iron][Cast aluminum,][Cast stainless steel,][Cast nickel-silver,] center of handrail [2-1/2 inches][3-1/8 inches]<Insert dimension> from [face of railing][wall].
- B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.
 1. For [aluminum][and][stainless steel] railings, provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.
- C. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint, complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- E. Shop Primers: Provide primers that comply with [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]
- F. Universal Shop Primer: 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.
- G. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
- H. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- I. Intermediate Coats and Topcoats: Provide products that comply with [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]
- J. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
- K. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- L. Bituminous Paint: Cold-applied asphalt emulsion, complying with ASTM D1187/D1187M.

- M. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout, complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- N. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.
 - 1. Water-Resistant Product: [At exterior locations][and][where indicated on Drawings], provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended by manufacturer for exterior use.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage[, but not less than that required to support structural loads].
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.
 - 1. Clearly mark units for reassembly and coordinated installation.
 - 2. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water.
 - 1. Provide weep holes where water may accumulate.
 - 2. Locate weep holes in inconspicuous locations.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with [welded][or][nonwelded] connections unless otherwise indicated.
- H. Gates: Form gates from steel tube of same size and shape as top rails, with infill to match guards. Provide with [cam-type, self-closing][spring] hinges for fastening to wall and overlapping stop with rubber bumper to prevent gate from opening in direction opposite egress.
- I. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove flux immediately.
 4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for [Finish #1 welds; ornamental quality with no evidence of a welded joint][Finish #2 welds; good appearance, completely sanded joint, some undercutting and pinholes okay][Finish #3 welds; utilitarian appearance not subject to view, partially dressed weld with spatter removed].
- J. Welded Connections for Aluminum Pipe: Fabricate railings to interconnect members with concealed internal welds that eliminate surface grinding, using manufacturer's standard system of sleeve and socket fittings.
- K. Nonwelded Connections: Connect members with concealed mechanical fasteners and fittings. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
1. Fabricate splice joints for field connection, using an epoxy structural adhesive, if this is manufacturer's standard splicing method.
- L. Form changes in direction as follows:
1. As detailed.
 2. [By bending][or][by inserting prefabricated elbow fittings].
 3. [By flush bends][or][by inserting prefabricated flush-elbow fittings].
 4. [By radius bends of radius indicated][or][by inserting prefabricated elbow fittings of radius indicated].
 5. By bending to smallest radius that will not result in distortion of railing member.
- M. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- N. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.
- O. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- P. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- Q. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
 2. Coordinate anchorage devices with supporting structure.
- R. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.
- S. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.
1. Provide socket covers designed and fabricated to resist being dislodged.
 2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.
- T. Expanded-Metal Infill Panels: Fabricate infill panels from expanded-metal sheet of same metal as railings.
1. Edge panels with U-shaped channels made from metal sheet, of same metal as expanded metal and not less than 0.043 inch thick.
 2. Orient expanded metal with long dimension of diamonds [parallel to top rail][perpendicular to top rail][horizontal][vertical].
- U. Perforated-Metal Infill Panels: Fabricate infill panels from perforated metal made from [steel][galvanized steel][aluminum][stainless steel][same metal as railings in which they are installed].
1. Edge panels with U-shaped channels made from metal sheet, of same metal as perforated metal and not less than 0.043 inch thick.
 2. Orient perforated metal with pattern [parallel to top rail][perpendicular to top rail][horizontal][vertical][as indicated on Drawings].
- V. Woven-Wire Mesh Infill Panels: Fabricate infill panels from woven-wire mesh crimped into 1-by-1/2-by-1/8-inch metal channel frames.
1. Fabricate wire mesh and frames from same metal as railings in which they are installed.
 2. Orient wire mesh with [diamonds vertical][diamonds perpendicular to top rail][wires perpendicular and parallel to top rail][wires horizontal and vertical][as indicated on Drawings].
- W. 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.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
1. Hot-dip galvanize [exterior][indicated] steel railings, including hardware, after fabrication.

2. Comply with ASTM A123/A123M for hot-dip galvanized railings.
 3. Comply with ASTM A153/A153M for hot-dip galvanized hardware.
 4. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.
- C. Preparing Galvanized Railings for Shop Priming: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with etching cleaner[and as follows].
1. Comply with SSPC-SP 16.
- D. For nongalvanized-steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves; however, hot-dip galvanize anchors to be embedded in exterior concrete or masonry.
- E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [SSPC-SP 6/NACE No. 3.][SSPC-SP 3.][requirements indicated below:]
1. Exterior Railings: SSPC-SP 6/NACE No. 3.
 2. Railings Indicated To Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3.
 3. Railings Indicated To Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3.
 4. Other Railings: SSPC-SP 3.
- F. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1 for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
1. Shop prime uncoated railings with [universal shop primer][primers specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting"] unless [zinc-rich primer is][primers specified in Section 099600 "High-Performance Coatings" are] indicated.
 2. Do not apply primer to galvanized surfaces.
- G. Shop-Painted Finish: Comply with [Section 099113 "Exterior Painting."][Section 099600 "High-Performance Coatings."]
1. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
- H. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1 for shop painting. Apply at spreading rates recommended by coating manufacturer.
1. Color: [As indicated by manufacturer's designations][Match Architect's

sample][As selected by Architect from manufacturer's full range].

2.8 ALUMINUM FINISHES

- A. 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 unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- B. Mill Finish: AA-M12, nonspecular as fabricated.
- C. Clear Anodic Finish: AAMA 611, [AA-M12C22A41][AA-M12C22A31].
- D. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44][AA-M12C22A32/A34].
 - 1. Color: [Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities].
- E. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- F. High-Performance Organic Finish, Two-Coat Polyvinylidene Fluoride (PVDF): Fluoropolymer finish complying with [AAMA 2604][AAMA 2605] and containing not less than [50][70] percent polyvinylidene fluoride (PVDF) resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [for seacoast and severe environments].
 - 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- G. Superior Performance Organic Finish, Three-Coat Polyvinylidene Fluoride (PVDF): Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent polyvinylidene fluoride (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 [for seacoast and severe environments].
 - 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- H. Superior Performance Organic Finish, Four-Coat Polyvinylidene Fluoride (PVDF):

Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent polyvinylidene fluoride (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 [for seacoast and severe environments].

1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- I. Single-Coat Superior Performance FEVE Organic Finish: Single-coat fluoroethylene vinyl ether (FEVE) fluoropolymer finish, complying with AAMA 2605. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- J. Two-Coat Superior Performance FEVE Organic Finish: Two-coat fluoroethylene vinyl ether (FEVE) fluoropolymer finish complying with AAMA 2605. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.9 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 1. Run grain with long dimension of each piece.
 2. When polishing is completed, passivate and rinse surfaces.
 3. Remove embedded foreign matter and leave surfaces chemically clean.
- C. Stainless Steel Pipe and Tubing Finishes:
 1. 180-Grit Polished Finish: Uniform, directionally textured finish.
 2. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured finish.
 3. Polished and Buffed Finish: 320-grit finish followed by buffing [to a high luster finish][to a mirror-like finish][to match Architect's sample].
- D. Stainless Steel Sheet and Plate Finishes:
 1. Directional Satin Finish: ASTM A480/A480, No. 4.
 2. High-Luster Finish: ASTM A480/A480M, No. 7.

3. Mirror Finish: ASTM A480/A480M, No. 8.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION, GENERAL

- A. Perform cutting, drilling, and fitting required for installing railings.
 1. Fit exposed connections together to form tight, hairline joints.
 2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
 3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.
 4. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 5. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
 1. Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- C. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. 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 railings.
- B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

- C. 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 beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches of post.

3.4 ANCHORING POSTS

- A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts are inserted into sleeves, fill annular space between post and sleeve with [nonshrink, nonmetallic grout][or][anchoring cement], mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Form or core-drill holes not less than 5 inches deep and 3/4 inch 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 [nonshrink, nonmetallic grout][or][anchoring cement], mixed and placed to comply with anchoring material manufacturer's written instructions.
- C. Cover anchorage joint with flange of same metal as post, [welded to post after placing anchoring material][attached to post with setscrews].
- D. Leave anchorage joint exposed with [1/8-inch buildup, sloped away from post][anchoring material flush with adjacent surface].
- E. Anchor posts to metal surfaces with flanges, angle type, or floor type, as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel railings, weld flanges to post and bolt to metal supporting surfaces.
 - 2. For aluminum railings, attach posts as indicated, using fittings designed and engineered for this purpose.
 - 3. For stainless steel railings, weld flanges to post and bolt to supporting surfaces.
- F. Install removable railing sections, where indicated, in slip-fit stainless steel sockets cast in concrete.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends to concrete and masonry with [sleeves concealed within][flanges connected to][brackets on underside of rails connected to] railing ends and anchored to wall construction with anchors and bolts.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and [welded to railing ends][or][connected to railing ends, using nonwelded connections].
- C. Attach handrails to walls with wall brackets[, except where end flanges are used]. Provide brackets with [1-1/2-inch]<Insert dimension> clearance from inside face of handrail and finished wall surface.
 - 1. Use type of bracket with [flange tapped for concealed anchorage to threaded

- hanger bolt][predrilled hole for exposed bolt anchorage].
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets[and railing end flanges] 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 wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into [fire-retardant-treated]wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements, using self-tapping screws of size and type required to support structural loads.
6. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

E. Install railing gates level, plumb, and secure for full opening without interference.

1. Attach hardware using tamper-resistant or concealed means.
2. Adjust hardware for smooth operation.

3.6 REPAIR

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."]

3.7 CLEANING

- A. Clean [aluminum][and][stainless steel] by washing thoroughly with clean water and soap and rinsing with clean water.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

3.8 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.
- 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 71 00 - DECORATIVE METAL STAIRS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes decorative metal stairs.
- B. Related Requirements:
 - 1. Section 057113 "Fabricated Metal Spiral Stairs."
 - 2. Section 093013 "Ceramic Tiling" for ceramic-tile treads and landings.
 - 3. Section 096340 "Stone Flooring" for stone treads and landings.
 - 4. Section 096400 "Wood Flooring" for wood treads and landings.
 - 5. [Section 096613 "Portland Cement Terrazzo Flooring"] [Section 096623 "Resinous Matrix Terrazzo Flooring"] for field-cast terrazzo treads and landings.

1.2 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written instructions to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs.
 - 1. 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.
 - 2. Deliver such items to Project site in time for installation.

1.3 ACTION SUBMITTALS

- A. Product Data: For metal stairs and the following:
 - 1. Shop primer products.
 - 2. Precast concrete treads.
 - 3. Precast terrazzo treads.
 - 4. Grout.
- B. Sustainable Design Submittals:
 - 1. Environmental product declaration.
 - 2. Third-Party Certifications: For each product.
 - 3. Third-Party Certified Life Cycle Assessment: For each product.
- C. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
 2. Indicate sizes of metal sections, thickness of metals, profiles, holes, and field joints.
 3. Include plan at each level.
- D. Samples for Verification: For each type and finish of tread.
- E. Delegated Design Submittal: For stairs, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the [jurisdiction][State] in which Project is located.
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. 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/D1.3M, "Structural Welding Code - Sheet Steel."
 4. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification.
1. Keep members off ground and spaced by using pallets, dunnage, or other supports and spacers.
 2. Protect members and packaged materials from corrosion and deterioration.
 3. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures.
 - a. Repair or replace damaged materials or structures as directed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design stairs,[and railings,] including attachment to building construction.
- B. Structural Performance of Stairs: Metal stairs withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Uniform Load: 100 lbf/sq. ft..
 - 2. Concentrated Load: 300 lbf applied on an area of 4 sq. in..
 - 3. Uniform and concentrated loads need not be assumed to act concurrently.
 - 4. Stair Framing: Capable of withstanding stresses resulting from railing loads in addition to loads specified above.
 - 5. Limit deflection of treads, platforms, and framing members to $[L/360][L/720]$ <Insert deflection ratio> or 1/4 inch, whichever is less.
- C. Seismic Performance of Stairs: Metal stairs withstand the effects of earthquake motions determined according to $[ASCE/SEI 7]$ <Insert requirement>.
 - 1. Component Importance Factor: <Insert requirement>.

2.2 METALS

- A. Metal Surfaces: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than $[25]$ <Insert value> percent.
- C. Steel Tubing: $[ASTM A500/A500M (cold formed)][or][ASTM A513/A513M]$.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than $[25]$ <Insert value> percent.
- D. Stainless Steel Bars and Shapes: ASTM A276/A276M, $[Type 304][Type 316L]$.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than $[25]$ <Insert value> percent.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A1008/A1008M,[either commercial steel, Type B, or] structural steel, Grade 25, unless another grade is required by design loads; exposed.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer

recycled content not less than [25]<Insert value> percent.

- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A1011/A1011M, [either commercial steel, Type B, or] structural steel, Grade 30, unless another grade is required by design loads.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- G. Galvanized-Steel Sheet: ASTM A653/A653M, G90 coating, [either commercial steel, Type B, or] structural steel, Grade 33, unless another grade is required by design loads.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- H. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304][Type 316], stretcher-leveled standard of flatness.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- I. Bronze Sheet: ASTM B36/B36M, Alloy UNS C28000 (muntz metal, 60 percent copper) or Alloy UNS C23000 (red brass, 85 percent copper).
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- J. Brass Sheet: ASTM B36/B36M, Alloy UNS C26000 (cartridge brass, 70 percent copper).
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- K. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 temper.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- L. Titanium Sheet: ASTM B265, Grade 1.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- M. Aluminum Sheet: Flat sheet complying with ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with strength and durability properties of not less than Alloy 5005-H32.
 - 1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.

- N. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- O. Aluminum Castings: ASTM B26/B26M, Alloy 443.0-F.
1. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- P. Bronze Extrusions: ASTM B455, Alloy UNS No. C38500 (extruded architectural bronze).
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- Q. Bronze Castings: ASTM B584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- R. Nickel Silver Extrusions: ASTM B151/B151M, Alloy UNS No. C74500.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- S. Nickel Silver Castings: ASTM B584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- T. Cast Iron: Either gray iron, ASTM A48/A48M, or malleable iron, ASTM A47/A47M, unless otherwise indicated.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.

2.3 ABRASIVE NOSINGS

- A. Extruded Units: [Aluminum][Bronze] units with abrasive filler consisting of aluminum oxide, silicon carbide, or a combination of both, in an epoxy-resin binder. Fabricate units in lengths necessary to accurately fit openings or conditions.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Safety Tread Co., Inc]
 - b. [Amstep Products]
 - c. [Armstrong Products, Inc]
 - d. [Balco; a CSW Industrials Company]
 - e. [Ecoglo, Inc.]
 - f. [Granite State Casting Co]
 - g. [Nystrom, Inc.]
 - h. [UPNOVR, Inc.]
 - i. [Wooster Products Inc]
 - j. <Insert manufacturer's name>
2. Provide ribbed units, with abrasive filler strips projecting 1/16 inch above aluminum extrusion.
 3. Provide solid-abrasive units without ribs.
 4. Nosings: Square-back units, [1-7/8 inches][3 inches][4 inches] wide, without lip.
 5. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.

2.4 FASTENERS

- A. General: Provide [zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5][Type 304 stainless steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5] where built into exterior walls.
 1. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F1554, Grade 36, of dimensions indicated; with nuts, ASTM A563; and, where indicated, flat washers.
 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for [exterior stairs][stairs indicated to be galvanized][stairs indicated to be shop primed with zinc-rich primer].
- D. Post-Installed Anchors: [Torque-controlled expansion anchors][or][chemical anchors] capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E488/E488M, conducted by a qualified independent testing agency.
 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
 2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy [Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Electrodes: Comply with AWS requirements.
- B. Shop Primers: Provide primers that comply with [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]
- C. Universal Shop Primer: 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.
- D. Zinc-Rich Primer: Complying with SSPC-Paint 20, [Type I-A][Type I-B][Type I-C][Type II], Level [1][2][3], and compatible with topcoat.
- E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with [SSPC-Paint 20][ASTM A780/A780M] and compatible with paints specified to be used over it.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi unless otherwise indicated.
- I. Nonslip-Aggregate Concrete Finish: Factory-packaged abrasive aggregate made from fused, aluminum-oxide grits or crushed emery; rustproof and nonglazing; unaffected by freezing, moisture, or cleaning materials.
- J. Plain Steel Welded-Wire Reinforcement: ASTM A1064/A10645M, [steel,][galvanized steel,] 6 by 6 inches, W1.4 by W1.4, unless otherwise indicated on Drawings.
 - 1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- K. Reinforcement Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.
 - 1. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete.
 - 2. For galvanized reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.
- L. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged,

nonmetallic aggregate grout; recommended by manufacturer for [interior][exterior] use; noncorrosive and nonstaining; mixed with water to consistency suitable for application and a 30-minute working time.

2.6 PRECAST CONCRETE TREADS

- A. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, ready-mixed concrete with a minimum 28-day compressive strength of 5000 psi and a total air content of not less than 4 percent or more than 6 percent.
- B. Reinforcement: Galvanized, welded-wire reinforcement, 2 by 2 inches by 0.062-inch- diameter steel wire; comply with ASTM A1064/A1064M, except for minimum wire size.

2.7 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.
- B. Assemble stairs in shop to greatest extent possible.
 - 1. Disassemble units only as necessary for shipping and handling limitations.
 - 2. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately.
 - 1. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated.
 - 2. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- 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 to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 - No evidence of a welded joint.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed

fasteners where possible.

1. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated.
2. Locate joints where least conspicuous.

2.8 FABRICATION OF STAIRS

- A. NAAMM Stair Standard: Comply with NAAMM AMP 510, "Metal Stairs Manual," for Architectural Class, unless more stringent requirements are indicated.
- B. Stair Framing:
 1. Stringers: Fabricate of [steel plates][steel channels][steel plates or channels][steel tubes][as indicated on Drawings].
 - a. Stringer Size: [As required to comply with "Performance Requirements" Article][As indicated on Drawings].
 - b. Provide closures for exposed ends of [channel][tube] stringers.
 - c. Finish: [Shop primed][Painted][Galvanized].
 2. Platforms: Construct of steel [plate][channel][plate or channel][rectangular tube] headers and miscellaneous framing members as [required to comply with "Performance Requirements" Article][indicated on Drawings].
 - a. Provide closures for exposed ends of [channel][tube] framing.
 - b. Finish: [Shop primed][Painted][Galvanized].
 3. Weld[or bolt] stringers to headers; weld[or bolt] framing members to stringers and headers.[If using bolts, fabricate and join so bolts are not exposed on finished surfaces.]
- C. Subtreads, Risers, and Subplatforms:
 1. Fabricate subtreads and subplatforms of steel [plates][shapes indicated on Drawings].
 2. Form subtreads, risers, and subplatforms to configurations indicated from [uncoated, cold-rolled steel sheet][uncoated, hot-rolled steel sheet][galvanized steel sheet][of thickness needed to comply with performance requirements, but not less than 0.075 inch thick][of thickness indicated on Drawings].
 3. Weld subtreads to stringers.
 - a. Locate welds on top of subtreads where they will be concealed by finished treads.
 4. Provide subplatforms of configuration indicated or, if not indicated, the same as subtreads.
 - a. Weld subplatforms to platform framing.
 - b. Locate welds on top of subplatforms where they will be concealed by

- c. finished flooring.
Smooth Soffit Construction: Construct subplatforms with flat metal under surfaces to produce smooth soffits.

2.9 STAIR RAILINGS

- A. Comply with applicable requirements in Section 057300 "Decorative Metal Railings."
 - 1. Connect posts to stair framing by direct welding unless otherwise indicated.

2.10 FINISHES

- A. Finish metal stairs after assembly.
- B. Steel Galvanized Finish: Hot-dip galvanize items as indicated to comply with ASTM A153/A153M for steel and iron hardware and with ASTM A123/A123M for other steel and iron products.
 - 1. Do not quench or apply post-galvanizing treatments that might interfere with paint adhesion.
 - 2. Fill vent and drain holes that are exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
- C. Steel Shop Prime Finish:
 - 1. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with [SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."][SSPC-SP 3, "Power Tool Cleaning."]
 - 2. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - a. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- D. Aluminum Finishes:
 - 1. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.
 - 2. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 - a. Color: [Champagne][Light bronze][Medium bronze][Dark bronze][Black]<Insert color>.
- E. Stainless Steel Finishes:
 - 1. Stainless Steel Tubing Finishes:
 - a. 180-Grit Polished Finish: Uniform, directionally textured finish.
 - b. 320-Grit Polished Finish: Oil-ground, uniform, fine, directionally textured

finish.

- c. Polished and Buffed Finish: 320-grit finish followed by buffing [to a high luster finish][to a mirror-like finish][to match Architect's sample].

2. Stainless Steel Sheet and Plate Finishes:

- a. Directional Satin Finish: ASTM A480/A480M, No. 4.
- b. High Luster Finish: ASTM A480/A480M, No. 7.
- c. Mirror Finish: ASTM A480/A480M, No. 8.

F. Bronze Finishes:

- 1. Statuary Conversion Coating over Satin Finish: CDA M31-C55 (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide)[, with color matching Architect's sample].
- 2. Statuary Conversion Coating over Satin Finish, Lacquered: CDA M31-C55-O6x (Mechanical Finish: directionally textured, fine satin; Chemical Finish: conversion coating, sulfide; Coating: clear, organic, air dried, as specified below)[, with color matching Architect's sample]:
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
- 3. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.

G. Brass Finishes:

- 1. Buffed Finish, Lacquered: CDA M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
- 2. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.

H. Copper Finishes:

1. As Fabricated: CDA M12 (Matte finish as fabricated).
2. Buffed Finish: CDA M21 (Mechanical Finish: buffed, smooth specular).
3. Hand-Rubbed Finish: CDA M31-M34 (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed).
4. Medium-Satin Finish: CDA M32 (Mechanical Finish: directionally textured, medium satin).
5. Fine-Matte Finish: CDA M42 (Mechanical Finish: nondirectional finish, fine matte).
6. Buffed Finish, Lacquered: CDA M21-O6x (Mechanical Finish: buffed, smooth specular; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
7. Hand-Rubbed Finish, Lacquered: CDA M31-M34-O6x (Mechanical Finish: directionally textured, fine satin; Mechanical Finish: directionally textured, hand rubbed; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
8. Medium-Satin Finish, Lacquered: CDA M32-O6x (Mechanical Finish: directionally textured, medium satin; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.
9. Fine-Matte Finish, Lacquered: CDA M42-O6x (Mechanical Finish: nondirectional finish, fine matte; Coating: clear, organic, air dried, as specified below).
 - a. Clear, Organic Coating: Lacquer specified for copper alloys, applied by air spray in two coats per manufacturer's written instructions, with interim drying, to a total thickness of 1 mil.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify elevations of floors, bearing surfaces and locations of bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLING METAL STAIRS

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where

necessary for securing metal stairs to in-place construction.

1. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Install metal stairs by welding stair framing to steel structure or to weld plates cast into concrete unless otherwise indicated.
 1. Grouted Baseplates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates.
 - a. Clean bottom surface of plates.
 - b. Set plates for structural members on wedges, shims, or setting nuts.
 - c. Tighten anchor bolts after supported members have been positioned and plumbed.
 - d. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - e. Promptly pack grout solidly between bearing surfaces and plates so no voids remain.
 - 1) Neatly finish exposed surfaces; protect grout and allow to cure.
 - 2) Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete or masonry.
- E. Fit exposed connections accurately together to form hairline joints.
 1. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations.
 2. 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.
 3. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- F. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."
 1. Install abrasive nosings with anchors fully embedded in concrete.
 2. Center nosings on tread width.
- G. Install precast concrete treads with adhesive supplied by manufacturer.
- H. Install precast terrazzo treads according to manufacturer's written instructions.

3.3 REPAIRS

A. Touchup Painting:

1. Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - a. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
2. Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in [Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."][Section 099600 "High-Performance Coatings."][Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."]

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A780/A780M.

END OF SECTION 05 71 00

SECTION 05 73 00 DECORATIVE METAL RAILINGS**Part 1 - General:****1.1 Section Includes**

Pre-engineered Versa™ powder coated aluminum Railing System. All drawings, general and supplementary conditions including division one specifications apply to this section.

1.2 Related Sections

Division 5: Ornamental Handrails and Railings

1.3 Product References and Design Requirements**1.3.1 Principle items specified in this section are:**

- a. Stainless steel and Stainless/wood combination handrails.
- b. Aluminum guardrails or other ornamental barrier railings.
- c. Tempered-laminated glass infill panels.
- d. Powder coated aluminum horizontal infill rails.
- e. Powder coated aluminum picket infill panels.
- f. Stainless steel rail with LED light insert.

1.3.2 Design requirements are based on IBC/IRC and ADA standards:

- a. Guardrails and handrails shall meet or exceed all applicable building codes.
- b. Railings shall have high strength stainless steel and aluminum to comply with structural requirements with an appropriate safety margin.
- c. All internal members shall be aluminum or stainless steel to eliminate the possibility of rust.
- d. Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.3.3 Work Included

Provide all materials, labor and equipment necessary to fabricate and completely install handrails, guardrails, infill panels, and other railing options as shown on drawings or specific herein.

1.3.4 Definitions

Terms and definitions from ASTM E985 and ISO/TC 59 for railing related items apply to this section.

1.4 System Performance Requirements**1.4.1 Railings shall meet or exceed the requirements of all applicable building codes.****1.4.2 Railings shall have high strength stainless steel in order to comply with 1.4.1 with adequate safety margin.****1.4.3 All internal members shall be stainless steel or aluminum to eliminate the possibility of rust.****1.4.4 Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.**

1.5 Submittals

- 1.5.1 Shop Drawings for architectural approval, showing fabrication and installation of handrails and railings including plans, elevations, sections, details of components and attachments to other units of work.
- 1.5.2 Product data for aluminum/stainless steel/wood products to be supplied by the manufacturer.
- 1.5.3 Structural computations or test data/evaluations, material properties, PE (professional engineering) calculations signed/sealed in the State of the project, and other information needed to ensure satisfactory structural compliance to applicable building codes to be supplied by the manufacturer, based on final fabrication drawings and documents.
- 1.5.4 Maintenance instructions: Provide manufacturer's maintenance and cleaning instructions.
- 1.5.5 Warranty: Provide manufacturer's warranty effective from completion of work.
- 1.5.6 Initial selection
Provide 6" long handrail samples complete with supports and rosette covers to demonstrate stainless steel grade and finish.
- 1.5.7 Final verification
Qualification data for authorized installers specified in **Quality Assurance** is to demonstrate their capabilities and experience. Include list of completed projects with project and architect names.

1.6 Quality Assurance

- 1.6.1 **Single Source Responsibility:** Materials shall be **supplied** by HDI Railing Systems, 3905 Continental Drive, Columbia PA 17512 (Tel: 717-285-4088 Fax 717-285-5083). www.hdirailings.com Regionally based Sales Managers available.
- 1.6.2 Execution tolerance plus/minus 5/64" (2 mm).

1.7 Storage

- 1.7.1 Store handrails and railing systems in clean, dry location, away from uncured concrete and masonry, protected against damage of any kind.
- 1.7.2 Materials must be kept in original packing until installation.

1.8 Project Conditions

- 1.8.1 All measurements for handrails and railings should be taken from construction site elements to which railings are to fasten. This information to be recorded on final shop drawings.
- 1.8.2 Coordinate fabrication schedule with construction progress to avoid delay of work.

Part 2 - Product:

2.1 Manufacturer

2.1.1. Mechanically fastened stainless steel and aluminum railing systems

Manufacturer shall be **HDI Railing Systems**, an established U.S. manufacturer of a custom pre-engineered, mechanically fastened guardrail and handrail systems, in strict compliance with all technical requirements of the drawings and specifications. Miscellaneous metal fabricators/suppliers will not be acceptable. This standard is based on HDI Railing Systems, 3905 Continental Drive, Columbia PA 17512 (Tel. 717.285.4088 Fax. 717.285.5083).

2.1.2 Substitutions: See substitution section

2.2 Materials for Guardrails and Handrail System

2.2.1 All rails and other tubular components shall be constructed using the following:

2.2.1.1 Aluminum grade 6063-T6 1" x 3" guard rail tube. Attached handrail to be Stainless steel grade type AISI 304/304L or 316/316L; surface to be 240 grain/grit finish; tubes 1-1/2" (38mm) outside diameter by 5/64" (2 mm) wall thickness. Powder coating options available.

2.2.2 All posts and other components shall be constructed using the following:

2.2.2.1 Aluminum grade 6063-T6, Square profile 2"(50mm) x 2"(50mm) with a .250"(6.35mm) wall thickness. Hardware attachment surface to be through post to base. All steel anchors and bolts to be powder coated to required color (standard listed herein) or custom RAL® color:

Vintage Bronze

2.2.2.2 Surface and side fastening plates and clamps to be made from aluminum and powder coated to match railings.

2.2.3 Fastening bolts to be stainless steel or other high strength material as determined by engineering requirements.

2.2.4 Glass and aluminum infill pickets/midrail panels to be mechanically attached to upper and lower horizontal rails and fastened mechanically to posts.

2.2.5 Exterior and aggressive environments require powder coating over the 6063-T6 and 6061-T6 components to minimize maintenance requirements.

2.3 Glass products, glazing and infill materials

2.3.1 Tempered-Laminated glass: Provide fully tempered safety glass with polished edges and dubbed (blunt) corners complying with ASTM C1048. Kind FT (fully tempered), condition A (un-coated). Types 1 (transparent glass, flat), quality Q3 (glazing select), class, thickness and manufacturing process as indicated below. Tempered-laminated glass infill panels are required in railings where there is access to areas below the railing (check local codes).

- 2.3.2 Clear glass: Class 1 clear
- 2.3.4 Allowable thickness 7/16" (11.11 mm) to 9/16" (14.28 mm) to be noted on final shop drawings.
- 2.3.6 Manufacturing process: Manufacture fully tempered glass by horizontal (roller hearth) process with roll wave distortion parallel with bottom edge of glass as installed.

2.11 Fasteners

Anchors shall be fabricated from stainless steel or other materials as determined by engineering requirements with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing per ASTM E488.

2.12 Fabrication

- 2.12.1 Fabricate railing system for compliance with structural requirements of applicable code.
- 2.12.2 Pre-assemble railings prior to shipping to greatest extent possible to ensure QC. Disassemble units and pack as appropriate for shipping and handling requirements. Clearly mark crates and boxes for re-assembly by location and for coordination with shop drawings.
- 2.12.3 Stainless steel tubing cuts shall be square, without burrs and where exposed, rounded to produce smooth rigid and hairline joints.

Part 3 – Execution:

3.1 Examination

- 3.1.1 Do not begin installation until substrates have been properly prepared.
- 3.1.2 Verify that reinforcement and anchoring devices are the correct type, have been located correctly, and have been installed properly.
- 3.1.3 If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 Preparation

Provide information on fastening point locations for posts where necessary to relevant parties.

3.3 Installation

Installation shall be by **HDI Railing Systems** or a qualified, authorized representative of the manufacturer. HDI Railing Systems, 3905 Continental Drive, Columbia PA 17512 (Tel: 717-285-4088 Fax 717-285-5083).

- 3.3.1 Installation must be in accordance with standard or non-standard, yet applicable details (instructions) included on installation/shop drawings provided by **HDI Railing Systems**.
- 3.3.2 Install components plumb and in-line, accurately fitted, free from distortion or defects and securely anchored to structure.
- 3.3.3 Provide anchors, plates, angles, etc., necessary for connecting railings to structure.

3.3.4 Any and all field welding shall be by a certified welder.

3.3.5 Access for anchors that require through bolting either vertically or horizontally to be made available through General Contractor.

Erection tolerances

3.3.6 Maximum variation from plumb shall be 1/4" (6mm).

3.3.7 Maximum offset from true alignment for every 50-foot of railing shall be 1/4" (6 mm), non-accumulative.

3.4 Cleaning and Protection

3.4.1 Remove manufacturer's protective coverings from exposed surfaces after installation.

3.4.2 Railings shall be cleaned, including infill panels, by contractor to the satisfaction of the owner.

3.4.3 Wipe with moistened cloth only. Do not use cleaning agents with abrasive or acid/alkaline content.

3.4.4 General contractor to provide protective covering on handrails and guardrails if construction is not yet finished in the area where the railings are installed.

3.5 Correction of deficiencies

All deficiencies in work and/or items not meeting specified requirements shall be corrected in order to meet specification requirements at no additional cost to owner.

End of Section

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preserved-treated lumber.
3. Fire-retardant-treated lumber.
4. Dimension lumber framing.
5. Miscellaneous lumber.
6. Plywood backing panels.

B. Related Requirements:

1. Section 061533 "Wood Patio Decking" for elevated decks, including support framing.
2. Section 061600 "Sheathing" for sheathing, subflooring, and underlayment.
3. Section 061753 "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.
4. Section 064013 "Exterior Architectural Woodwork" for exterior wood stairs and railings.
5. Section 064023 "Interior Architectural Woodwork" for interior wood stairs and railings.
6. Section 313116 "Termite Control" for site application of borate treatment to wood framing.

1.2 DEFINITIONS

- A. Boards or Strips: Lumber of less than 2 inches nominal size in least dimension.
- B. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- C. Exposed Framing: Framing not concealed by other construction.
- D. Lumber grading agencies, and abbreviations used to reference them, include the following:
 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 2. NLGA: National Lumber Grades Authority.
 3. SPIB: The Southern Pine Inspection Bureau.
 4. WCLIB: West Coast Lumber Inspection Bureau.
 5. WWPAA: Western Wood Products Association.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-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. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
- B. Sustainable Design Submittals:

1.4 INFORMATIONAL SUBMITTALS

- A. Material Certificates:
 - 1. For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.
 - 2. For preservative-treated wood products. Indicate type of preservative used and net amount of preservative retained.

1.5 QUALITY ASSURANCE

1.6 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS

- A. Lumber: Comply with DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, [mark grade stamp on end or back of each piece][or][omit grade stamp and provide certificates of grade compliance issued by grading agency].
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry wood products.
4. Dress lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content:

1. Boards: [15][19] percent.
2. Dimension Lumber: [15 percent][19 percent][15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness][15 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness][19 percent for 2-inch nominal thickness or less; no limit for more than 2-inch nominal thickness] unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWP A U1, Use categories as follows:

1. UC1: Interior construction not in contact with ground or subject to moisture. Include [all rough carpentry.][the following items:]
 - a. Wood sills, sleepers, blocking, [furring,][stripping,]and similar concealed members in contact with masonry or concrete.
 - b. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - c. Wood floor plates that are installed over concrete slabs-on-grade.
 - d. Wood furniture.
 - e. Wood millwork.
 - f. <Insert item>.
2. UC2: Interior construction not in contact with ground but may be subject to moisture. Include [all rough carpentry.][the following items:]
 - a. Wood sills, sleepers, blocking, [furring,][stripping,]and similar concealed members in contact with masonry or concrete.
 - b. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - c. Wood floor plates that are installed over concrete slabs-on-grade.
 - d. Wood millwork.
 - e. Wood flooring.
 - f. <Insert item>.
3. UC3A (Commodity Specification A): Coated sawn products in exterior construction not in contact with ground but exposed to all weather cycles including intermittent wetting. Include [all rough carpentry.][the following items:]

- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - c. Wood siding and trim.
 - d. <Insert item>.
4. UC3A (All Other Commodity Specifications): Coated products excluding sawn products in exterior construction not in contact with ground, exposed to all weather cycles but protected from liquid water. Include [all rough carpentry.][the following items:]
- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - c. Wood floor plates that are installed over concrete slabs-on-grade.
 - d. Wood siding and trim.
 - e. Wood sheathing.
 - f. <Insert item>.
5. UC3B (Commodity Specification A): Uncoated sawn products in exterior construction not in contact with ground, exposed to all weather cycles including intermittent wetting but with sufficient air circulation for wood to dry. Excludes sawn products not in contact with ground but with ground contact-type hazards. Include [all rough carpentry.][the following items:]
- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - c. Wood decking, railings, and joists and beams for decks that are not critical to the performance and safety of the entire system/construction and that are in locations easily accessible for maintenance, repair, or replacement.
 - d. <Insert item>.
6. UC3B (All Other Commodity Specifications): Uncoated products excluding sawn products in exterior construction not in contact with ground, exposed to all weather cycles including prolonged wetting. Include [all rough carpentry.][the following items:]
- a. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - b. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - c. <Insert item>.

7. UC4A (Commodity Specification A): Non-critical sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, and sawn products not in contact with ground but with ground contact-type hazards or that are critical or hard to replace. Include [all rough carpentry.][the following items:]
 - a. Wood framing members that are less than 6 inches above the ground.
 - b. Joists and beams when they are difficult to maintain, repair, or replace and are critical to the performance and safety of the entire system/construction.
 - c. <Insert item>.
8. UC4A (All Other Commodity Specifications): Non-critical products excluding sawn products in contact with ground and exposed to all weather cycles, normal exposure conditions. Include [all rough carpentry.][the following items:]
 - a. <Insert item>.
9. UC4B (Commodity Specification A): Critical or difficult-to-replace sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, high decay potential, and salt water splash. Include [all rough carpentry.][the following items:]
 - a. Wood foundations.
 - b. <Insert item>.
10. UC4B (All Other Commodity Specifications): Critical or difficult-to-replace products excluding sawn products in contact with ground and exposed to all weather cycles including high decay potential and salt water splash. Include [all rough carpentry.][the following items:]
 - a. <Insert item>.
11. UC4C (Commodity Specification A): Critical structural sawn products in contact with ground and exposed to all weather cycles including continuous or prolonged wetting, severe environments, and extreme decay potential. Include [all rough carpentry.][the following items:]
 - a. Wood foundation piling.
 - b. <Insert item>.
12. UC4C (All Other Commodity Specifications): Critical structural products excluding sawn products in contact with ground and exposed to all weather cycles including severe environments and extreme decay potential. Include [all rough carpentry.][the following items:]
 - a. Wood foundation piling.
 - b. <Insert item>.
13. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.[Do not use inorganic boron (SBX) for sill plates.]

14. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to require incising, contain colorants, bleed through, or otherwise adversely affect finishes.
 15. After treatment, redry [boards][dimension lumber] to 19 percent maximum moisture content.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.
- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
1. For exposed lumber indicated to receive a stained or natural finish, [mark end or back of each piece][or][omit marking and provide certificates of treatment compliance issued by inspection agency].
- D. Application: Treat [all rough carpentry unless otherwise indicated.][items indicated on Drawings, and the following:]
1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, [furring,][stripping,] and similar concealed members in contact with masonry or concrete.
 3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 5. Wood floor plates that are installed over concrete slabs-on-grade.
 6. <Insert item>.

2.3 FIRE-RETARDANT-TREATED LUMBER

- A. General: Where fire-retardant-treated materials are indicated, materials are to comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested in accordance with ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Treatment is not to promote corrosion of metal fasteners.
 2. Exterior Type: Treated materials are to comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering in accordance with ASTM D2898. Use for exterior locations and where indicated.

3. Interior Type A: Treated materials are to have a moisture content of 28 percent or less when tested in accordance with ASTM D3201/D3201M at 92 percent relative humidity. Use where exterior type is not indicated.
 4. Design Value Adjustment Factors: Treated lumber is to be tested according to ASTM D5664 and design value adjustment factors are to be calculated according to ASTM D6841.[For enclosed roof framing, framing in attic spaces, and where high temperature fire-retardant treatment is indicated, provide material with adjustment factors of not less than 0.85 modulus of elasticity and 0.75 for extreme fiber in bending for Project's climatological zone.]
- C. Kiln-dry lumber after treatment to maximum moisture content of 19 percent.[Kiln-dry plywood after treatment to maximum moisture content of 15 percent.]
- D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency and other information required by authorities having jurisdiction.
1. For exposed lumber indicated to receive a stained or natural finish, [mark end or back of each piece][or][omit marking and provide certificates of treatment compliance issued by testing agency].
- E. For exposed items indicated to receive a stained or natural finish, chemical formulations are not to bleed through, contain colorants, or otherwise adversely affect finishes.
- F. Application: Treat [all rough carpentry unless otherwise indicated.][items indicated on Drawings, and the following:]
1. Framing for raised platforms.
 2. Framing for stages.
 3. Concealed blocking.
 4. Framing for non-load-bearing partitions.
 5. Framing for non-load-bearing exterior walls.
 6. Wood cants, nailers, curbs, equipment support bases, blocking, and similar members in connection with roofing.
 7. Plywood backing panels.
 8. <Insert item>.

2.4 DIMENSION LUMBER FRAMING

- A. Non-Load-Bearing Interior Partitions by Grade: [Construction or No. 2][Construction, Stud, or No. 3][Standard, Stud, or No. 3] grade.
1. Application: [All interior partitions][Interior partitions not indicated as load bearing].
 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine or mixed southern pine; SPIB.
 - c. Spruce-pine-fir; NLGA.
 - d. Hem-fir; WCLIB, or WWPA.

- e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
 - f. Northern species; NLGA.
 - g. Eastern softwoods; NeLMA.
 - h. Western woods; WCLIB or WWP.
- B. Load-Bearing Partitions by Grade: [No. 2][Construction or No. 2][Construction, Stud, or No. 3] grade.
 - 1. Application: [Exterior walls][and][interior load-bearing partitions].
 - 2. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWP.
 - d. Southern pine or mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWP.
 - g. Hem-fir; WCLIB or WWP.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
- C. Machine Stress-Rated (MSR) Lumber Partitions: Any species of MSR dimension lumber with a grade of not less than [2400f-2.0E][2100f-1.8E][1650f-1.5E]<Insert grade>.
 - 1. Application: [Exterior walls][and][interior load-bearing partitions].
- D. Load-Bearing Partitions by Performance: Any species and grade with a modulus of elasticity of at least [1,500,000 psi][1,300,000 psi][1,100,000 psi][1,000,000 psi][900,000 psi] and an extreme fiber stress in bending of at least [1000 psi][850 psi][700 psi][600 psi][500 psi] for 2-inch nominal thickness and 12-inch nominal width for single-member use.
 - 1. Application: [Exterior walls][and][interior load-bearing partitions].
- E. Ceiling Joists: [Construction or No. 2][Construction, Stud, or No. 3][Standard, Stud, or No. 3] grade.
 - 1. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWP.
 - d. Douglas fir-larch (north); NLGA.
 - e. Southern pine or mixed southern pine; SPIB.
 - f. Spruce-pine-fir; NLGA.
 - g. Hem-fir; WCLIB or WWP.
 - h. Douglas fir-south; WWP.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
 - j. Northern species; NLGA.
 - k. Eastern softwoods; NeLMA.

- I. Western woods; WCLIB or WWP.
- F. Joists, Rafters, and Other Framing by Grade: [Select Structural][No. 1][No. 2][Construction or No. 2][Construction, Stud, or No. 3] grade.
- 1. Species:
 - a. Hem-fir (north); NLGA.
 - b. Southern pine; SPIB.
 - c. Douglas fir-larch; WCLIB or WWP.
 - d. Southern pine or mixed southern pine; SPIB.
 - e. Spruce-pine-fir; NLGA.
 - f. Douglas fir-south; WWP.
 - g. Hem-fir; WCLIB or WWP.
 - h. Douglas fir-larch (north); NLGA.
 - i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
- G. Joists, Rafters, and Other Framing by Performance: Any species and grade with a modulus of elasticity of at least [1,500,000 psi][1,300,000 psi][1,100,000 psi][1,000,000 psi][900,000 psi] and an extreme fiber stress in bending of at least [1000 psi][850 psi][700 psi][600 psi][500 psi] for 2-inch nominal thickness and 12-inch nominal width for single-member use.
- H. Exposed Framing: Hand-select material[indicated to receive a stained or natural finish] for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
- 1. Species and Grade:
 - a. As indicated above for load-bearing construction of same type.
 - b. Hem-fir (north); [Select Structural][No. 1] grade; NLGA.
 - c. Southern pine; [Select Structural][No. 1][No. 2] grade; SPIB.
 - d. Douglas fir-larch; [Select Structural][No. 1] grade; WCLIB or WWP.
 - e. Mixed southern pine; [Select Structural][No. 1][No. 2] grade; SPIB.
 - f. Spruce-pine-fir; [Select Structural][No. 1] grade; NLGA.
 - g. Douglas fir-south; [Select Structural][No. 1] grade; WWP.
 - h. Hem-fir; [Select Structural][No. 1] grade; WCLIB or WWP.
 - i. Douglas fir-larch (north); [Select Structural][No. 1] grade; NLGA.
 - j. Spruce-pine-fir (south); [Select Structural][No. 1] grade; NeLMA, WCLIB, or WWP.
 - k. Eastern hemlock-balsam fir or eastern hemlock-tamarack; [Select Structural][No. 1] grade; NeLMA.
 - l. Beech-birch-hickory; [Select Structural][No. 1] grade; NeLMA.
 - m. Northern red oak; [Select Structural][No. 1] grade; NeLMA.
 - n. Redwood; [Clear Heart Structural][Clear Structural][Select Structural][No. 1] grade; RIS.
 - o. Mixed oak; [Select Structural][No. 1] grade; NeLMA.
 - p. Mixed maple; [Select Structural][No. 1] grade; NeLMA.
 - q. Western cedars; [Select Structural][No. 1] grade; WCLIB or WWP.

2.5 MISCELLANEOUS LUMBER

- A. Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
 2. Nailers.
 3. Rooftop equipment bases and support curbs.
 4. Cants.
 5. Furring.
 6. Grounds.
 7. Utility shelving.
- B. Dimension Lumber Items: [Construction or No. 2][Standard, Stud, or No. 3] grade lumber of [any species.][any of the following species:][the following species:]
1. Hem-fir (north); NLGA.
 2. Mixed southern pine or southern pine; SPIB.
 3. Spruce-pine-fir; NLGA.
 4. Hem-fir; WCLIB or WWPA.
 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
 6. Western woods; WCLIB or WWPA.
 7. Northern species; NLGA.
 8. Eastern softwoods; NeLMA.
- C. Utility Shelving: Lumber with [15][19] percent maximum moisture content of [any of the following][the following] species and grades:
1. Eastern white pine, Idaho white, lodgepole, ponderosa, or sugar pine; [Premium or No. 2 Common (Sterling)][Standard or No. 3 Common] grade; NeLMA, NLGA, WCLIB, or WWPA.
 2. Mixed southern pine or southern pine; No. [1][2] grade; SPIB.
 3. Hem-fir or hem-fir (north); [Select Merchantable or No. 1 Common][Construction or No. 2 Common] grade; NLGA, WCLIB, or WWPA.
 4. Spruce-pine-fir (south) or spruce-pine-fir; [Select Merchantable or No. 1 Common][Construction or No. 2 Common] grade; NeLMA, NLGA, WCLIB, or WWPA.
- D. Concealed Boards: [15][19] percent maximum moisture content and [any of]the following species and grades:
1. Mixed southern pine or southern pine; No. [2][3] grade; SPIB.
 2. Hem-fir or hem-fir (north); [Construction or No. 2 Common][Standard or No. 3 Common] grade; NLGA, WCLIB, or WWPA.
 3. Spruce-pine-fir (south) or spruce-pine-fir; [Construction or No. 2 Common][Standard or No. 3 Common] grade; NeLMA, NLGA, WCLIB, or WWPA.
 4. Eastern softwoods; No. [2][3] Common grade; NeLMA.
 5. Northern species; No. [2][3] Common grade; NLGA.
 6. Western woods; [Construction or No. 2 Common][Standard or No. 3 Common] grade; WCLIB or WWPA.

- E. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.
- F. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- G. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, [Exterior, A-C][Exterior, C-C Plugged][Exposure 1, C-D Plugged], [fire-retardant treated,] in thickness indicated or, if not indicated, not less than [1/2-inch][3/4-inch] nominal thickness.

2.7 FASTENERS

- A. General: Fasteners are to be of size and type indicated and comply with requirements specified in this article for material and manufacture. Provide nails or screws, in sufficient length, to penetrate not less than 1-1/2 inches into wood substrate.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners[with hot-dip zinc coating complying with ASTM A153/A153M or ASTM F2329][of Type 304 stainless steel].
 - 2. For redwood, use [brass/bronze][stainless steel][hot-dip galvanized-steel] fasteners.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on [ICC-ES AC01][ICC-ES AC58][ICC-ES AC193][or][ICC-ES AC308] as appropriate for the substrate.

2.8 MISCELLANEOUS MATERIALS

- A. Sill-Sealer Gaskets:
 - 1. Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.
 - 2. Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.
 - 3. Self-adhering sheet consisting of 64 mils of rubberized asphalt laminated on one side to a 4-mil- thick, polyethylene-film reinforcement, and with release liner on

adhesive side[; formulated for application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction].

- B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, [butyl rubber][or][rubberized-asphalt] compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.
- C. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
- D. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chlorpyrifos as its active ingredient.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set work to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate [furring,]nailers, blocking, [grounds,]and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.[Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.]
- D. Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.
- E. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- F. Install sill sealer gasket/termite barrier in accordance with manufacturer's written instructions at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.
- G. Do not splice structural members between supports unless otherwise indicated.
- H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

- I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal thickness.
 - 3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below partitions.
 - 4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.
- J. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- L. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.
- M. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in ICC's International Building Code (IBC).
 - 2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
 - 3. ICC-ES evaluation report for fastener.
- N. Securely attach roofing nailers to substrates by anchoring and fastening to withstand bending, shear, or other stresses imparted by Project wind loads and fastener-resistance loads as designed in accordance with ASCE/SEI 7.
- O. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 INSTALLATION OF WOOD BLOCKING AND NAILERS

- A. Install where indicated and where required for[screeding or] 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 wood blocking to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Attach wood roofing nailers securely to substrate to resist the designed outward and upward wind loads indicated on Drawings and in accordance with ANSI/SPRI ED-1, Tables A6 and A7.
- D. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 INSTALLATION OF WOOD FURRING

- A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
- B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal- size furring [horizontally][and][vertically] at [24 inches][600 mm] o.c.
- C. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal- size furring vertically at [16 inches][400 mm] o.c.

3.4 INSTALLATION OF WALL AND PARTITION FRAMING

- A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions[and for load-bearing partitions where framing members bearing on partition are located directly over studs]. Fasten plates to supporting construction unless otherwise indicated.
 - 1. For exterior walls, provide [2-by-6-inch nominal-][2-by-4-inch nominal-] size wood studs spaced [24 inches][16 inches][600 mm][400 mm] o.c. unless otherwise indicated.
 - 2. For interior partitions and walls, provide [2-by-6-inch nominal-][2-by-4-inch nominal-][2-by-3-inch nominal-] size wood studs spaced [24 inches][16 inches][600 mm][400 mm] o.c. unless otherwise indicated.
 - 3. Provide continuous horizontal blocking at midheight of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.
- B. Construct corners and intersections with three or more studs[, except that two studs may be used for interior non-load-bearing partitions].

- C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.
 - 1. For non-load-bearing partitions, provide double-jamb studs and headers not less than 4-inch nominal depth for openings 48 inches and less in width, 6-inch nominal depth for openings 48 to 72 inches in width, 8-inch nominal depth for openings 72 to 120 inches in width, and not less than 10-inch nominal depth for openings 10 to 12 feet in width.
 - 2. For load-bearing walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated[or, if not indicated, according to Table R602.7(1) or Table R602.7(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings].
- D. Provide diagonal bracing in [exterior walls, at both walls of each external corner][walls, at locations indicated], at 45-degree angle, full-story height unless otherwise indicated. Use [1-by-4-inch nominal- size boards, let-in flush with faces of studs][metal wall bracing, let into studs in saw kerf].

3.5 INSTALLATION OF FLOOR JOIST FRAMING

- A. General: Install floor joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry. Attach floor joists as follows:
 - 1. Where supported on wood members, by[toe nailing or by] using metal framing anchors.
 - 2. Where framed into wood supporting members, by using wood ledgers as indicated or, if not indicated, by using metal joist hangers.
- B. Fire Cuts: At joists built into masonry, bevel cut ends 3 inches and do not embed more than 4 inches.
- C. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 48 inches.
- D. Do not notch in middle third of joists; limit notches to one-sixth depth of joist, one-third at ends. Do not bore holes larger than one-third depth of joist; do not locate closer than 2 inches from top or bottom.
- E. Provide solid blocking of 2-inch nominal thickness by depth of joist at ends of joists unless nailed to header or band.
- F. Lap members framing from opposite sides of beams, girders, or partitions not less than 4 inches or securely tie opposing members together. Provide solid blocking of 2-inch nominal thickness by depth of joist over supports.
- G. Anchor members paralleling masonry with 1/4-by-1-1/4-inch metal strap anchors spaced not more than 96 inches o.c., extending over and fastening to three joists. Embed anchors at least 4 inches into grouted masonry with ends bent at right angles

and extending 4 inches beyond bend.

- H. Provide solid blocking between joists under jamb studs for openings.
- I. Under non-load-bearing partitions, provide double joists separated by solid blocking equal to depth of studs above.
 - 1. Provide triple joists separated as above, under partitions receiving ceramic tile and similar heavy finishes or fixtures.
- J. Provide bridging of type indicated below, at intervals of 96 inches o.c., between joists.
 - 1. Diagonal wood bridging formed from bevel-cut, 1-by-3-inch nominal- size lumber, double-crossed and nailed at both ends to joists.
 - 2. Steel bridging installed to comply with bridging manufacturer's written instructions.

3.6 INSTALLATION OF CEILING JOIST AND RAFTER FRAMING

- A. Ceiling Joists: Install with crown edge up and complying with requirements specified above for floor joists. Face nail to ends of parallel rafters.
 - 1. Where ceiling joists are at right angles to rafters, provide additional short joists parallel to rafters from wall plate to first joist; nail to ends of rafters and to top plate, and nail to first joist or anchor with framing anchors or metal straps. Provide 1-by-8-inch nominal- size or 2-by-4-inch nominal- size stringers spaced 48 inches o.c. crosswise over main ceiling joists.
- B. Rafters: Notch to fit exterior wall plates and[toe nail or] use metal framing anchors. Double rafters to form headers and trimmers at openings in roof framing, if any, and support with metal hangers. Where rafters abut at ridge, place directly opposite each other and nail to ridge member or use metal ridge hangers.
 - 1. At valleys, provide double-valley rafters of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against valley rafters.
 - 2. At hips, provide hip rafter of size indicated or, if not indicated, of same thickness as regular rafters and 2 inches deeper. Bevel ends of jack rafters for full bearing against hip rafter.
- C. Provide collar beams (ties) as indicated or, if not indicated, provide 1-by-6-inch nominal-size boards between every third pair of rafters, but not more than 48 inches o.c. Locate below ridge member, at third point of rafter span. Cut ends to fit roof slope and nail to rafters.
- D. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.7 PROTECTION

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

END OF SECTION 06 10 00

SECTION 06 41 00 - ARCHITECTURAL WOOD CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood-veneer-faced casework for transparent finish.
2. Wood-veneer-faced casework for opaque finish.
3. Plastic-laminate-clad casework.
4. Wood materials.
5. Glass.
6. Casework hardware.
7. Accessories.
8. Shop finishing.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing cabinets that are concealed within other construction before cabinet installation.
2. Section 092216 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud-framing required for anchoring cabinets.
3. [Section 123616 "Metal Countertops."][Section 123619 "Wood Countertops."][Section 123623.13 "Plastic-Laminate-Clad Countertops."][Section 123640 "Stone Countertops."][Section 123661 "Simulated Stone Countertops."]

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.
- B. Wood Veneer Allowance: Wood veneer for architectural cabinets is part of [Wood Veneer Allowance]<Insert name of allowance>. Allowance includes the cost of veneer that is wasted due to selection, cutting, and trimming.

1.3 COORDINATION

- A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to support loads imposed by installed and fully loaded cabinets.
- B. Coordinate wood species, veneer, cut, grade, matching, finishing, and other requirements with [wood doors][wood paneling]<Insert item> as specified in [Section 064216 "Flush Wood Paneling."][Section 081416 "Flush Wood Doors."][Section 123553.19 "Wood Laboratory Casework."]<Insert Section number and title.>

- C. Hardware Coordination: Distribute copies of approved hardware schedule specified in [Section 087100 "Door Hardware"] [Section 087111 "Door Hardware (Descriptive Specification)"] to manufacturer of architectural cabinets; coordinate Shop Drawings and fabrication with hardware requirements.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference [at Project site] [by web conference] <Insert location>.
 - 1. Review locations and method of attachment of backing required for casework installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include panel material description and finish.
 - 2. Include glazing.
 - 3. Include accessories.
 - 4. Include hardware.
 - 5. Include shop finishing.
- B. Shop Drawings:
 - 1. Plans, elevations, sections, and attachment details.
 - a. Show large-scale details.
 - b. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
 - c. Show locations and sizes of cutouts and holes for items installed in architectural cabinets.
 - d. Show veneer leaves with dimensions, grain direction, exposed face, and identification numbers indicating the flitch and sequence within the flitch for each leaf.
 - 2. Apply AWI's Quality Certification Program (hereafter AWI QCP) label to Shop Drawings.
- C. Samples for Initial Selection: For each exposed product and for each color and finish specified, in manufacturer's standard size.
- D. Samples for Verification: Provide a minimum of three samples showing the full range of color and/or grain to be expected in the finished work, for the following.
 - 1. Lumber for Transparent Finish: Not less than 8 inches long by 3/4 inch thick, and as wide as practical, for each species and cut, finished on one side and one edge.
 - 2. Veneer Leaves: Representative of and selected from flitches to be used for

transparent-finished cabinets. Samples to show the full range of color and grain to be expected.

3. Veneer Panel for Transparent Finish: 8 by 8 inches by 1/4 inch, representative of and selected from flitches to be used for transparent-finished casework.
4. Lumber and Panel Products with Shop-Applied Opaque Finish: Not less than 8 inches long by 3/4 inches thick, and as wide as practical, for each species and cut for lumber and 8 by 10 inches for panels, for each finish system and color.
 - a. Finish [entire][one-half of] exposed surface.
5. Plastic Laminates: 8 by 8 inches, for each type, color, pattern, and surface finish required.
 - a. Provide one Sample applied to core material with specified edge material applied to one edge.
6. Thermally Fused Laminate (TFL) Panels: 8 by 10 inches, for each color, pattern, and surface finish.
 - a. Provide edgebanding on one edge.
7. Corner Pieces:
 - a. Cabinet-front frame joints between stiles and rails and at exposed end pieces, 18 inches high by 18 inches wide by 6 inches deep.
 - b. Miter joints for standing trim.
8. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

E. Sustainable Design Submittals:

1.6 INFORMATIONAL SUBMITTALS

- A. Test Reports: Valid AWI "Performance Quality Test Report" indicating compliance with specified ANSI/AWI 0641 Structural Performance Duty Level.
- B. Certification Reports:
 1. Provide [labels][and][certificates] from AWI QCP indicating woodwork [complies][and] installation comply] with requirements of aesthetic grade and duty level specified.
 - a. Project has been registered with AWI as AWI QCP Number <Insert number>.
 - b. Register the Work of this Section with AWI's Quality Certification Program.
- C. Product Certificates: For[each type of product.][the following:]
 1. Composite wood products.
 2. Thermally fused laminate (TFL) panels.

3. Glass.
4. Adhesives.

- D. Field quality control reports.
- E. Qualification Statements: For [manufacturer][and][Installer].

1.7 CLOSEOUT SUBMITTALS

- A. Quality Standard Compliance Certificates: AWI QCP Certificate.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Employs skilled workers who custom fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
 1. Manufacturer's Certification: Licensed participant in AWI's Quality Certification Program.
- B. Installer Qualifications: [Manufacturer of products][Licensed participant in AWI QCP].

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups of [typical architectural cabinets as indicated on Drawings]<Insert description>.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

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

1.11 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature and relative humidity at levels planned for building occupants

during the remainder of the construction period.

- B. Environmental Limitations with Humidity Control: Do not deliver or install cabinets until building is enclosed, wet-work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between [25 and 45][30 and 55][43 and 65]<Insert numbers> percent during the remainder of the construction period.
- C. Field Measurements: Where cabinets are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support cabinets by field measurements before being enclosed/concealed by construction, and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where cabinets are indicated to fit to other construction, establish dimensions for areas where cabinets are to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names of preapproved woodworking firms>.

2.2 PERFORMANCE REQUIREMENTS

- A. Unless otherwise indicated, comply with ANSI/AWI 0641 for duty level and grade of architectural cabinets indicated for construction, finishes, installation, and other requirements.
 - 1. Provide [labels][and][certificates] from AWI QCP indicating that woodwork [complies][and installation comply] with requirements of aesthetic grade and duty level specified.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of the Contract Documents in addition to those of the referenced quality standard.

2.3 WOOD-VENEER-FACED CASEWORK FOR TRANSPARENT FINISH

A. Architectural Woodwork Institute (AWI) Standard:

1. Structural Performance Duty Level: [1][2][3][4][As indicated on Drawings].
2. Aesthetic Performance Grade: [Premium][Custom][Economy][As indicated on Drawings].

B. Casework Construction Type: [Frameless][Face frame].

C. Door and Drawer-Front:

1. Design: [Flush panel][Stile and rail].
2. Style: [Flush overlay][Reveal overlay][Flush inset].
 - a. Reveal Dimension: [1/2 inch][As determined by hinge type and clearance][As indicated on Drawings]<Insert dimension>.

D. Exposed Exterior Surfaces:[As indicated on Drawings.]

1. Species: [Red oak][White oak][White ash][White birch][Select white maple][As indicated on Drawings]<Insert species>.
2. Cut: [Plain sliced/plain sawn][Rift cut/rift sawn][Quarter cut/quarter sawn].
3. Grain Direction: [Vertically for drawer fronts, doors, and fixed panels][Horizontally for drawer fronts, doors, and fixed panels][Vertically for doors and fixed panels, horizontally for drawer fronts][As indicated on Drawings].
4. Veneer Matching:
 - a. Matching of Veneer Leaves: [Book][Slip][Random] match.
 - b. Veneer Matching within Panel Face: [Running][Balance][Center-balance] match.
 - c. Veneer Matching within Room: Provide cabinet veneers in each room or other space from a single flitch with doors, drawer fronts, and other surfaces matched in a sequenced set with continuous match where veneers are interrupted perpendicular to the grain.
 - d. Blueprint Matching: Match veneers on casework[, wall paneling,][and][doors] in room indicated on Drawings.
5. Edgeband: [Solid wood][Veneer] matching exposed surfaces.

E. Exposed Interior Surfaces:[As indicated on Drawings.]

1. Species: [Match exposed exterior surfaces][Red oak][White oak][White ash][White birch][Select white maple][As indicated on Drawings]<Insert species>.
2. Cut: [Match exposed exterior surfaces][Plain sliced/plain sawn][Rift cut/rift sawn][Quarter cut/quarter sawn].
3. Veneer Matching: Match exposed exterior surfaces.
4. Edgeband: [Solid wood][Veneer][Match exposed exterior surfaces].

F. Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: [Same species wood veneer panel indicated for exposed surfaces][Thermally fused laminate (TFL) panels][High-pressure decorative laminate (HDPL)][Compatible species to that indicated for exposed surfaces, stained to match]<Insert requirements>.
2. Drawer Subfronts, Backs, and Sides: [Solid-hardwood lumber, same species indicated for exposed surfaces][Solid-hardwood lumber, stained to match species indicated for exposed surfaces][Solid birch or maple hardwood lumber][Seven- or nine-ply hardwood plywood with no internal voids][Thermally fused laminate (TFL) panels]<Insert requirements>.
3. Drawer Bottoms: [Hardwood plywood][Thermally fused laminate (TFL) panels]<Insert requirements>.
4. Shelves: [Adjustable][Fixed].
 - a. Loading Capacity: [40 lb/sq. ft][50 lb/sq. ft].
5. Edgeband: [Wood veneer compatible for color and grain of exposed surfaces][PVC or polyester][Match exposed surfaces]<Insert requirements>.

2.4 WOOD-VENEER-FACED CASEWORK FOR OPAQUE FINISH

- A. Architectural Woodwork Institute (AWI) Standard:
 1. Structural Performance Duty Level: [1][2][3][4][As indicated on Drawings].
 2. Aesthetic Performance Grade: [Premium][Custom][Economy][As indicated on Drawings].
- B. Casework Construction Type: [Frameless][Face frame].
- C. Door and Drawer-Front:
 1. Design: [Flush panel][Stile and rail].
 2. Style: [Flush overlay][Reveal overlay][Flush inset].
 - a. Reveal Dimension: [1/2 inch][As determined by hinge type and clearance][As indicated on Drawings]<Insert dimension>.
- D. Exposed Exterior Surfaces: [Any closed-grain hardwood suitable for opaque finish][Medium-density fiberboards (MDF)][Medium-density overlay (MDO)].
 1. Edgeband: [Solid wood][Veneer] matching exposed surfaces.
- E. Exposed Interior Surfaces: [Any closed-grain hardwood suitable for opaque finish][Medium-density fiberboards (MDF)][Medium-density overlay (MDO)].
 1. Edgeband: [Solid wood][Veneer][Match exposed exterior surfaces].
- F. Semiexposed Surfaces:
 1. Surfaces Other Than Drawer Bodies: [Match materials indicated for exposed surfaces][Thermally fused laminate (TFL) panels]<Insert requirements>.
 2. Drawer Sides and Backs: [Solid birch or maple hardwood lumber][Seven- or

- nine-ply hardwood plywood with no interior voids][Thermally fused laminate (TFL) panels]<Insert requirements>.
3. Drawer Bottoms: [Hardwood plywood][Thermally fused laminate (TFL) panels]<Insert requirements>.
 4. Shelves: [Fixed][Adjustable].
 - a. Loading Capacity: [40 lb/sq. ft][50 lb/sq. ft].
 5. Edgeband:
 - a. Edges of Veneer Panels: [Solid wood][Veneer][Veneer tape] compatible for color and grain of exposed surfaces.
 - b. Edges of Thermally Fused Laminate (TFL) Panels: [PVC or ABS, 0.018-inch minimum thickness][PVC, 3.0 mm thick].

2.5 PLASTIC-LAMINATE-CLAD CASEWORK

A. Architectural Woodwork Institute (AWI) Standard:

1. Structural Performance Duty Level: [1][2][3][4][As indicated on Drawings].
2. Aesthetic Performance Grade: [Premium][Custom][Economy][As indicated on Drawings].
3. Product Data: Verify materials were fabricated within 100 miles of Project site from materials that have been extracted, harvested, or recovered within 100 miles of Project site.
4. Product Data: Verify materials were fabricated within 500 miles of Project site from materials that have been extracted, harvested, or recovered within 500 miles of Project site. If materials are transported by rail or water, multiply the distance by 0.25 to determine the distance to Project site.
5. Certified Wood: Verify wood products are certified as "FSC Pure"[or "FSC Mixed Credit"] in accordance with FSC STD-01-001 and FSC STD-40-004.
6. Certified Wood: Verify wood products are labeled in accordance with the AF&PA's Sustainable Forestry Initiative, certified as "FSC Pure" in accordance with FSC STD-01-001 and FSC STD-40-004, or certified and labeled in accordance with the standards of the Programme for Endorsement of Forest Certification.
7. Certified Wood: Verify wood products are certified in accordance with the American Tree Farm System's "ATFS 2021 Standards of Sustainability," the AF&PA's Sustainable Forestry Initiative, FSC STD-01-001 and FSC STD-40-004, or the standards of the Programme for Endorsement of Forest Certification.
8. Composite Wood Products: Verify products are made using ultra-low-emitting formaldehyde resins, as defined in CARB 93120, "Airborne Toxic Control Measure (ATCM) for Formaldehyde Emissions from Composite Wood Products," or are made with no added formaldehyde.
9. Composite Wood Products: Verify formaldehyde emission rates are not greater than the following when tested in accordance with ASTM D6007 or ASTM E1333:
 - a. Hardwood Plywood: 0.05 ppm.
 - b. Particleboard: 0.09 ppm.
 - c. MDF More Than 5/16 Inch (8 mm) Thick: 0.11 ppm.

- d. MDF 5/16 Inch (8 mm) or Less in Thickness: 0.13 ppm.
- 10. Verify adhesives have a VOC content of [30]<Insert number> g/L or less.
- B. Casework Construction Type: [Frameless][Face frame].
- C. Door and Drawer-Front:
 - 1. Design: [Flush panel][Stile and rail].
 - 2. Style: [Flush][Reveal] overlay.
 - a. Reveal Dimension: [1/2 inch][As determined by hinge type and clearance][As indicated on Drawings]<Insert dimension>.
- D. High-Pressure Decorative Laminate (HDPL): ISO 4586-3, grades as indicated or, if not indicated, as required by quality standard.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ABET Inc.]
 - b. [Formica Corporation]
 - c. [Laminart LLC]
 - d. [Pionite; a Panolam Industries International, Inc. brand]
 - e. [Wilsonart LLC]
 - f. <Insert manufacturer's name>
- E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
 - 1. As indicated by laminate manufacturer's designations.
 - 2. Match Architect's sample.
 - 3. As selected by Architect from laminate manufacturer's full range in the following categories:
 - a. Solid colors, [gloss][matte] finish.
 - b. Solid colors with core same color as surface, [gloss][matte] finish.
 - c. Wood grains, [gloss][matte] finish.
 - d. Patterns, [gloss][matte] finish.
- F. Exposed Exterior Surfaces:
 - 1. Plastic-Laminate Grade: [HGP][HGS][VGS].
 - 2. Pattern Direction: [Vertically for drawer fronts, doors, and fixed panels][Horizontally for drawer fronts, doors, and fixed panels][As indicated on Drawings].
 - 3. Edgebanding: [High-pressure decorative laminate (HDPL)][PVC or ABS, 0.018-inch minimum thickness][PVC, 3.0 mm thick].

- G. Exposed Interior Surfaces: [High-pressure decorative laminate (HDPL) the same color and pattern as exposed exterior surfaces][Thermally fused laminate (TFL) the same color and pattern as exterior surfaces].
1. Edgebanding: [High-pressure decorative laminate (HDPL)][PVC or ABS, 0.018-inch minimum thickness][PVC, 3.0 mm thick].
- H. Semiexposed Surfaces:
1. Surfaces Other Than Drawer Bodies: [High-pressure decorative laminate (HDPL) cabinet liner Grade CLS, ISO 4586-3][Thermally fused laminate (TFL) panels].
 2. Drawer Sides and Backs: [Solid-hardwood lumber][Seven- or nine-ply plywood with no internal voids][Thermally fused laminate (TFL) panels with PVC or polyester edgebanding].
 3. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate (HDPL), ISO 4583-3, grade to match exposed surface.
 4. Drawer Bottoms: [Hardwood plywood][Thermally fused laminate (TFL) panels].
 5. Shelves: [Fixed][Adjustable].
 - a. Loading Capacity: [40 lb/sq. ft][50 lb/sq. ft].
 6. Edgebanding: [High-pressure decorative laminate (HDPL)][PVC or ABS, 0.018-inch (0.460-mm) minimum thickness][PVC, 3.0 mm thick].

2.6 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Do not use plain-sawn softwood lumber with exposed, flat surfaces more than 3 inches wide.
 2. Wood Moisture Content:
 - a. Non-Climate-Controlled Environments: [7 to 12][9 to 15][10 to 15] percent.
 - b. Climate-Controlled Environments: [4 to 9][6 to 10][8 to 13] percent.
- B. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of architectural cabinet and quality grade specified unless otherwise indicated.
1. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
 2. Medium-Density Fiberboard (MDF): ANSI A208.2, [Grade 130]<Insert grade>.
 3. Particleboard (Medium Density): ANSI A208.1, [Grade M-2][Grade M-2-Exterior Glue].
 4. Softwood Plywood: DOC PS 1[, medium-density overlay].
 5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
 6. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with

thermally fused, melamine-impregnated decorative paper[and complying with requirements of AWI 300].

2.7 GLASS

- A. Float Glass for Cabinet Doors: ASTM C1036, Type I, [Class 1 (clear)][Class 2 or 3 (tinted)], Quality-Q3.
 - 1. Thickness: [3.0 mm][4.0 mm][5.0 mm][6.0 mm].
 - 2. Tint Color: [Blue-green][Bronze][Green][Gray]<Insert color>.
- B. Tempered Float Glass for Cabinet Doors: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated), complying with ANSI Z97.1.
 - 1. Door Inserts: Type I, [Class 1 (clear)][Class 2 or 3 (tinted)], Quality-Q3.
 - a. Thickness: [6.0 mm]<Insert thickness>.
 - b. Tint Color: [Blue-green][Bronze][Green][Gray]<Insert color>.
 - 2. Frameless Sliding Doors: Type I, [Class 1 (clear)][Class 2 or 3 (tinted)], Quality-Q3.
 - a. Thickness: [6.0 mm]<Insert thickness>.
 - b. Tint Color: [Blue-green][Bronze][Green][Gray]<Insert color>.
 - c. Unframed Glass Doors: Grind smooth and polish exposed edges and corners.
- C. Laminated Glass for Cabinet Doors: ASTM C1172, Type II, complying with ANSI Z97.1.
 - 1. Thickness: [6.0 mm]<Insert thickness>.
 - 2. Tint Color: [Blue-green][Bronze][Green][Gray]<Insert color>.
- D. Mirror Glass for Cabinet Doors: ASTM C1503, Mirror [Select][Glazing], Quality-Q3.
 - 1. Thickness: [3.0 mm][4.0 mm][5.0 mm][6.0 mm].
- E. Decorative Glass for Cabinet Doors: Provide decorative glass complying with Section 088113 "Decorative Glass Glazing."
- F. Tempered Float Glass for Cabinet Shelves: ASTM C1048, Kind FT, Condition A, Type I, [Class 1 (clear)][Class 2 or 3 (tinted)], Quality-Q3; with exposed edges seamed before tempering, 6 mm thick.
 - 1. Thickness: [3.0 mm][4.0 mm][5.0 mm][6.0 mm].
 - 2. Tint Color: [Blue-green][Bronze][Green][Gray]<Insert color>.

2.8 CASEWORK HARDWARE

- A. Cabinet Hardware: Provide cabinet hardware and accessory materials associated with

architectural cabinets except for items specified in [Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]

B. Hinges:

1. Butt Hinges: 2-3/4-inch, Grade 1 five-knuckle steel hinges made from 0.095-inch- thick metal, and as follows:
 - a. Semi-Concealed Hinges, Back Mounted, for Flush Doors: ANSI/BHMA A156.9, B01361.
 - b. Semi-Concealed Hinges, Back Mounted, for Overlay Doors: ANSI/BHMA A156.9, B01511.
2. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, [95-110][115-140][160-180] degrees of opening[, self-closing][, with integral soft-close damper].

C. Pulls and Knobs:

1. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011, 3-inch centers.
2. Wire Pulls: Back mounted, [solid metal][plastic], [4 inches long, 5/16 inch in diameter][5 inches long, 5/16 inch in diameter].
3. Back-Mounted Knobs: ANSI/BHMA A156.9, B02041.

D. Catches and Latches:

1. Magnetic Catches: ANSI/BHMA A156.9, B03141.
2. Push-in Magnetic Catches: ANSI/BHMA A156.9, B03132.
3. Roller Catches, Double Rollers: ANSI/BHMA A156.9, B03072.
4. Ball Friction Catches: ANSI/BHMA A156.9, B03013.

E. Shelf Rests and Standards:

1. Adjustable Shelf Standards and Supports: [ANSI/BHMA A156.9, B04071; with shelf rests, B04081][ANSI/BHMA A156.9, B04102; with shelf brackets, B04112].
2. Shelf Rests: ANSI/BHMA A156.9, B04013; [metal][plastic][two-pin plastic with shelf hold-down clip].

F. Drawer Slides: ANSI/BHMA A156.9.

1. Standard Duty (Grade 1 and Grade 2): [Side mount][Undermount][and extending under bottom edge of drawer].
2. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): [Side mount][Undermount].
 - a. Type: [Full][Full overtravel][Partial] extension.
 - b. Material: [Aluminum][Epoxy-coated polymer][Galvanized-steel ball-bearing][Stainless steel][Zinc-plated ball-bearing] slides.
 - c. Motion Feature: [Push to open][and][soft close dampener][self-closing mechanism].
3. Drawer Types:

- a. Pencil drawers not more than 3 inches high and not more than 24 inches wide provide [50 lb]<Insert weight> load capacity.
 - b. General-purpose drawers more than 3 inches high, but not more than 6 inches high and not more than 24 inches wide, provide [75 lb]<Insert weight> load capacity.
 - c. File drawers more than 6 inches high or more than 24 inches wide provide [100 lb]<Insert weight> load capacity.
 - d. Lateral file drawers more than 6 inches high and more than 24 inches, but not more than 30 inches wide, provide [150 lb]<Insert weight> load capacity.
 - e. Lateral file drawers more than 6 inches high and more than 30 inches wide provide [200 lb]<Insert weight> load capacity.
 - f. Computer keyboard tray provides [75 lb]<Insert weight> load capacity.
- G. Tracks for Sliding Glass Doors: [Surface][Recessed] mounting, ANSI/BHMA A156.9, B07063; [plastic][aluminum].
- H. Locks for Drawer and Hinged-Doors: [Cylindrical (cam)][Mortise] type, five-pin tumbler, brass with chrome-plated finish, and complying with ANSI/BHMA A156.11, Grade 1.
1. Provide a minimum of two keys per lock and six master keys.
 2. Provide locks [where indicated][on every door and drawer].
- I. Door Bumpers: Manufacturer's standard self-adhering clear silicone pads.
- J. Hardware Finish:
1. Exposed Hardware: Provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.
 - a. Dark, Oxidized, Satin Bronze, Oil Rubbed: ANSI/BHMA 613 for bronze base; ANSI/BHMA 640 for steel base.
 - b. Bright Brass, Clear Coated: ANSI/BHMA 605 for brass base; ANSI/BHMA 632 for steel base.
 - c. Bright Brass, Vacuum Coated: ANSI/BHMA 723 for brass base; ANSI/BHMA 729 for zinc-coated-steel base.
 - d. Satin Brass, Blackened, Bright Relieved, Clear Coated: ANSI/BHMA 610 for brass base; ANSI/BHMA 636 for steel base.
 - e. Satin Chromium Plated: ANSI/BHMA 626 for brass or bronze base; ANSI/BHMA 652 for steel base.
 - f. Bright Chromium Plated: ANSI/BHMA 625 for brass or bronze base; ANSI/BHMA 651 for steel base.
 - g. Satin Stainless Steel: ANSI/BHMA 630.
 2. Concealed Hardware: Manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.9 ACCESSORIES

- A. Grommets:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Doug Mockett & Company, Inc.]
 - b. [Hafele America Co.]
 - c. [W.W. Grainger, Inc.]
 - d. <Insert manufacturer's name>
2. Wire-Management Grommets: Circular, grommets and matching caps with slot for wire passage.
 - a. Finish: [Metal][Molded plastic].
 - b. Outside Diameter: [1-1/4 inches][2 inches]<Insert dimension>.
 - c. Color: [Brushed, nickel plated][Polished, chrome plated][Black, epoxy coated][Brown][Black]<Insert finish>.
3. Power/Data Grommets: UL-listed [recessed][pop-up] grommet.
 - a. Power Outlets: [Two][Three][Five].
 - b. USB Charger: [Type A][Type B][1 Dual]<Insert type>.
4. Paper Slot Grommet: [12 inches][17 inches] long by 1-3/4 inches wide by 1 inch deep; molded-plastic, paper-slot liner with 1/4 inch lip.
 - a. Color: [Brown][Black]<Insert color>.

2.10 FABRICATION

- A. Fabricate architectural cabinets to dimensions, profiles, and details indicated. Ease sharp edges and corners.
- B. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of dates and times architectural cabinet fabrication will be complete.
 2. Trial fit assemblies at manufacturer's shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements before disassembling for shipment.
- C. Shop-cut openings to maximum extent possible to receive hardware, appliances, 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.

- D. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in NGA's "GANA Glazing Manual."

1. For glass in wood frames, secure glass with removable stops.
2. For exposed glass edges, polish and grind smooth.

2.11 SHOP FINISHING

- A. Finish architectural cabinets at manufacturer's shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Shop-finish transparent-finished architectural cabinets at manufacturer's shop as specified in this Section. See Section 099123 "Interior Painting" for field finishing of opaque-finished architectural cabinets.
- C. Drawings indicate items that are required to be shop finished. Finish these items at manufacturer's shop as specified in this Section. See [Section 099123 "Interior Painting"] [and] [Section 099300 "Staining and Transparent Finishing"] for field finishing of architectural cabinets.
- D. Shop Priming: Shop apply the prime coat including backpriming, if any, for [transparent-finished] items specified to be field finished. See [Section 099123 "Interior Painting"] [and] [Section 099300 "Staining and Transparent Finishing"] for material and application requirements.
- E. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural cabinets, as applicable to each unit of work.
1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- F. Transparent Finish:
1. Aesthetic Performance Grade: [Premium][Custom][Economy][Same as item to be finished].
 2. Finish System: [TR-1, lacquer, nitrocellulose][TR-2A, lacquer, post-catalyzed][TR-2B, lacquer, pre-catalyzed][TR-3, latex acrylic, water-based][TR-4, varnish, conversion][TR-5, oil, synthetic penetrating][TR-6, polyurethane, catalyzed][TR-7, acrylic crosslinking, water-based][TR-8, acrylated epoxy, polyester, or urethane, UV-cure][TR-9, UV curable, water-based][TR-10, vinyl, catalyzed][TR-11, polyurethane, water-based][TR-12, polyester, catalyzed].
 3. Wash Coat for Closed-Grain Woods: Apply wash-coat sealer to cabinets made from closed-grain wood before staining and finishing.
 4. Staining: [None required][Match approved sample for color][Match Architect's sample].
 5. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
 6. Filled Finish for Open-Grain Woods: [After staining, apply wash-coat sealer and allow to dry.] Apply paste wood filler and wipe off excess. Tint filler to match stained wood.

7. Sheen: [Flat, 15-30][Satin, 31-45][Semigloss, 46-60][Gloss, 61-100] gloss units measured on 60-degree gloss meter per ASTM D523.

G. Opaque Finish:

1. Aesthetic Performance Grade: [Premium][Custom][Economy][Same as item to be finished].
2. Finish System: [OP-1, lacquer, nitrocellulose][OP-2A, lacquer, post-catalyzed][OP-2B, lacquer, pre-catalyzed][OP-3, latex acrylic, water-based][OP-4, varnish, conversion][OP-5, oil, synthetic penetrating][OP-6, polyurethane, catalyzed][OP-7, acrylic crosslinking, water-based][OP-8, acrylated epoxy, polyester, or urethane, UV-cure][OP-9, UV curable, water-based][OP-10, vinyl, catalyzed][OP-11, polyurethane, water-based][OP-12, polyester, catalyzed].
3. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
4. Sheen: [Flat, 15-30][Satin, 31-45][Semigloss, 46-60][Gloss, 61-100] gloss units measured on 60-degree gloss meter per ASTM D523.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.
 1. Confirm location and adequacy of blocking and supports required for installation.
 2. Verify size and locations of cutouts for appliances, special equipment, sinks, plumbing, and other items to be mounted in or adjacent to casework.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.3 INSTALLATION OF CASEWORK

- A. Install casework to comply with requirements of the structural and aesthetic performance specified.
- B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.
- C. Install cabinets level, plumb, and true in line to a tolerance of 1/8 inch in 96 inches using concealed shims.

1. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 2. Install cabinets without distortion so doors and drawers fit openings 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.
 3. Maintain veneer sequence matching of cabinets with transparent finish.
- D. Anchor cabinets in accordance with AWI requirements or tested method to anchors or blocking built in or directly attached to framing or substrates.
1. Install cabinets to comply with seismic requirements as indicated on Drawings.
- E. Shop Finishes: Touch up finishing after installation of architectural cabinets. Fill nail holes with matching filler.
1. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats are shop applied.
 - a. Use filler matching finish of items being installed.
- F. Field Finishing: See [Section 099123 "Interior Painting"] and [Section 099300 "Staining and Transparent Finishing"] for finishing of installed architectural cabinets.

3.4 FIELD QUALITY CONTROL

- A. Inspections: Provide inspection of installed Work through AWI's Quality Certification Program certifying that casework, including installation, complies with requirements of ANSI/AWI 0620 for the specified grade.
1. AWI QCP Inspector to prepare and submit inspection report.

3.5 ADJUSTING AND CLEANING

- A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where impossible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.
- B. Clean, lubricate, and adjust hardware and other moving parts to function smoothly.
- C. Clean cabinets on exposed and semiexposed surfaces. Touch up finishes to restore damaged or soiled areas.

END OF SECTION 06 41 00

SECTION 06 42 19 - PLASTIC-LAMINATE-FACED WOOD PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 057000 "Decorative Metal" for metal reveals at plastic-laminate-faced wood paneling.
2. Section 061000 "Rough Carpentry" for wood furring, blocking, shims, and hanging strips required for installing paneling that is concealed within other construction before paneling installation.

1.2 COORDINATION

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

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-faced wood paneling.

B. Product Data Submittals: For each product.

1. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

C. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.
3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

D. Shop Drawings: For plastic-laminate-faced wood paneling.

1. Include plans, elevations, sections, and attachment details.
2. Show details full size.

3. Show locations and sizes of furring and blocking, including concealed blocking specified in other Sections.
 4. Apply [AWI Quality Certification][WI Certified Compliance] Program label to Shop Drawings.
- E. Samples: For each exposed product and for each color and texture specified, in manufacturer's or fabricator's standard size.
- F. Samples for Initial Selection: For each type of plastic laminate.
- G. Samples for Verification: For each type of exposed laminate, [8 by 10 inches][12 by 12 inches].
1. Provide one Sample applied to core material[and with specified edge material applied to one edge].

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][fabricator].
- B. Product Certificates: For each type of product.
- C. Quality Standard Compliance Certificates: [AWI Quality Certification Program][WI Certified Compliance Program].
- D. Evaluation Reports: For fire-retardant-treated materials, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.
1. Shop Certification: [AWI's Quality Certification Program accredited participant][WI's Certified Compliance Program licensee].
- B. Installer Qualifications: [Fabricator of products][AWI's Quality Certification Program accredited participant][WI's Certified Compliance Program licensee].
- C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
1. Build mockups of [typical paneling as indicated on Drawings]<Insert description>.
 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not deliver paneling until painting and similar operations that might damage

paneling have been completed in installation areas. Store paneling in installation areas or in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.

1.8 FIELD CONDITIONS

- A. Environmental Limitations without Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature and relative humidity at levels planned for building occupants during the remainder of the construction period.
- B. Environmental Limitations with Humidity Control: Do not deliver or install paneling until building is enclosed, wet-work is complete, and HVAC system is operating and will maintain temperature between 60 and 90 deg F and relative humidity between [25 and 55][43 and 70][17 and 50]<Insert numbers> percent during the remainder of the construction period.
- C. Field Measurements: Where paneling is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Locate concealed framing, blocking, and reinforcements that support paneling by field measurements before being enclosed/concealed by construction and indicate measurements on Shop Drawings.
- D. Established Dimensions: Where paneling is indicated to fit to other construction, establish dimensions for areas where woodwork is to fit. Provide allowance for trimming at site, and coordinate construction to ensure that actual dimensions correspond to established dimensions.

PART 2 - PRODUCTS

2.1 PANELING FABRICATORS

- A. Fabricators: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available fabricators offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. <Insert, in separate subparagraphs, names and contact information for preapproved woodworking firms>.

2.2 PANELING, GENERAL

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

1. Provide inspections including installation together with labels and certificates from [AWI][WI] certification program indicating that woodwork complies with requirements of grades specified.
2. The Contract Documents contain requirements that are more stringent than the referenced woodwork quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

2.3 MATERIALS

- A. Materials, General: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
- B. Wood Moisture Content: [5 to 10][8 to 13][4 to 9] percent.
- C. Composite Wood Products: Provide materials that comply with requirements of referenced quality standard for each quality grade specified unless otherwise indicated.
 1. Recycled Content of MDF and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
 2. MDF: ANSI A208.2, [Grade 130]<Insert grade>.
 3. Particleboard (Medium Density): ANSI A208.1, [Grade M-2][Grade M-2-Exterior Glue].

2.4 FIRE-RETARDANT-TREATED MATERIALS

- A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
 1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are 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 to distinguish treated materials from untreated materials.
 3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.
- B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 1. Kiln-dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent, respectively.

2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.
 3. Mill lumber after treatment within limits set for wood removal that do not affect listed fire-test-response characteristics, using a woodworking shop certified by testing and inspecting agency.
 4. Mill lumber before treatment and implement procedures during treatment and drying processes that prevent lumber from warping and developing discolorations from drying sticks or other causes, marring, and other defects affecting appearance of paneling.
- C. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM E84.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Roseburg]
 - b. <Insert manufacturer's name>

2.5 INSTALLATION MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: [Softwood or hardwood lumber][Fire-retardant-treated softwood lumber], kiln-dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls.
- C. Installation Adhesive: Product recommended by panel fabricator for each substrate for secure anchorage.

2.6 FABRICATION

- A. Complete fabrication, including assembly, to maximum extent possible, before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
 1. Notify Architect seven days in advance of the dates and times paneling fabrication will be complete.
- B. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped

openings. Sand edges of cutouts to remove splinters and burrs.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Grade: Install paneling to comply with quality standard grade of paneling to be installed.
- B. Install paneling level, plumb, true in line, and without distortion. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches. Install with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.
 - 1. For flush paneling with revealed joints, install with variations in reveal width, alignment of top and bottom edges, and flushness between adjacent panels not exceeding [1/32 inch][1/16 inch].
- C. Anchor paneling to supporting substrate with [concealed panel-hanger clips][splined connection strips][blind nailing]. Do not use face fastening unless [covered by trim][otherwise indicated].

3.3 ADJUSTING AND CLEANING

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

END OF SECTION 06 42 19

SECTION 06 64 00 - PLASTIC PANELING

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring for installing plastic paneling.
2. Section 064219 "Plastic-Laminate-Faced Wood Paneling."
3. Section 102600 "Wall and Door Protection" for corner guards installed over plastic paneling.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
- C. Samples: For plastic paneling[and trim accessories], in manufacturer's standard sizes.

1.3 QUALITY ASSURANCE

- A. Testing Agency: [Acceptable to authorities having jurisdiction][FM Approvals].

1.4 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 SOURCE LIMITATIONS

- A. Obtain plastic paneling and trim accessories from single manufacturer.

2.2 ACCESSORIES

- A. Trim Accessories: Manufacturer's standard [one-piece][two-piece, snap-on] 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: [White][Match panels][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range].
- B. Exposed Fasteners: Nylon drive rivets recommended by panel manufacturer.
- C. 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.
- D. Adhesive: As recommended by plastic paneling manufacturer.
- E. Sealant: [Mildew-resistant, single-component, neutral-curing silicone][Mildew-resistant, single-component, neutral-curing or acid-curing silicone][Latex] sealant recommended by plastic paneling manufacturer and complying with requirements in Section 079200 "Joint Sealants."

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 adhesive bond, 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 [where indicated][to provide equal panels at ends of walls not less than half the width of full panels][so that trimmed panels at corners are not less than 12 inches wide].
 1. Mark plumb lines on substrate at [trim accessory][panel joint] locations for accurate installation.
 2. Locate [trim accessories][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][and][nails][or][staples]. [Do not fasten through panels.]
- 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 11 13 - BITUMINOUS DAMPPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied, emulsified-asphalt dampproofing.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for bituminous vapor retarders under slabs-on-grade.
2. [Section 042000 "Unit Masonry"] [Section 042200 "Concrete Unit Masonry"] for mortar parge coat on masonry surfaces.
3. [Section 071326 "Self-Adhering Sheet Waterproofing"] [Section 071353 "Elastomeric Sheet Waterproofing"] [Section 071354 "Thermoplastic Sheet Waterproofing"] [Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"] [Section 071416 "Cold Fluid-Applied Waterproofing"] for waterproofing.

1.2 ACTION SUBMITTALS

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

1.3 FIELD CONDITIONS

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

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain primary dampproofing materials and primers from single source from single manufacturer. Provide [protection course] [drainage panels] [and] auxiliary materials recommended in writing by manufacturer of primary materials.

2.2 PERFORMANCE REQUIREMENTS

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

2.3 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

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

1. [APOC, Inc; a division of Gardner Industries]
2. [Brewer Company (The)]
3. [ChemMasters, Inc]
4. [Euclid Chemical Company (The); a subsidiary of RPM International, Inc.]
5. [Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands)]
6. [Karnak Corporation]
7. [Mar-flex Waterproofing & Building Products]
8. [W. R. Meadows, Inc]
9. <Insert manufacturer's name>

- B. Trowel Coats: ASTM D1227/D1227M, Type II, Class 1.
- C. Fibered Brush and Spray Coats: ASTM D1227/D1227M, Type II, Class 1.
- D. Brush and Spray Coats: ASTM D1227/D1227M, Type III, Class 1.

2.4 AUXILIARY MATERIALS

- A. General: Auxiliary materials recommended in writing by dampproofing manufacturer for intended use and compatible with each other and with bituminous dampproofing.
- B. Cut-Back-Asphalt Primer: ASTM D41/D41M.
- C. Emulsified-Asphalt Primer: ASTM D1227/D1227M, Type III, Class 1, except diluted with water as recommended in writing by manufacturer.
- D. Asphalt-Coated Glass Fabric: ASTM D1668/D1668M, Type I.
- E. Patching Compound: [Epoxy or latex-modified repair mortar][Asbestos-free fibered mastic] of type recommended in writing by dampproofing manufacturer.

2.5 PROTECTION COURSE

- A. Protection Course, Asphaltic: ASTM D6506/D6506M; semirigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners.

1. Thickness: Nominal [1/8 inch][1/4 inch][1/8 inch for vertical applications; 1/4 inch elsewhere].
 2. Adhesive: Rubber-based solvent type recommended in writing by dampproofing manufacturer for protection course type.
- B. Protection Course, Extruded-Polystyrene Board Insulation, Faced: Fan folded, faced on [one side][or][both sides] with plastic film, nominal thickness 1/4 inch, with a compressive strength of not less than 8 psi when tested in accordance with ASTM D1621, and maximum water absorption by volume of 0.6 percent when tested in accordance with ASTM C272/C272M.
- C. Protection Course, Extruded-Polystyrene Board Insulation, Unfaced: ASTM C578, Type X, 1/2 inch thick.
- D. Protection Course, Molded-Polystyrene Board Insulation: ASTM C578, Type I, 0.90 lb/cu. ft. minimum density, 1-inch minimum thickness.
- E. Smooth-surfaced roll roofing complying with ASTM D6380/D6380M, Class S, Type III.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION OF BITUMINOUS DAMPPROOFING, GENERAL

- A. Comply with dampproofing manufacturer's written application instructions for cure time between coats and drying time before backfilling unless otherwise indicated.
 - 1. Apply dampproofing to provide continuous plane of protection.
 - 2. Apply additional coats if recommended in writing by manufacturer or to achieve a smooth surface and uninterrupted coverage.
- B. Where dampproofing footings and foundation walls, apply from finished-grade line to top of footing; extend over top of footing and down a minimum of 6 inches over outside face of footing.
 - 1. Extend dampproofing 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed.
 - 2. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where indicated as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required.
- C. Where dampproofing exterior face of inner wythe of exterior masonry cavity walls, lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe.
 - 1. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe.
 - 2. Lap dampproofing at least 1/4 inch onto shelf angles supporting veneer.
- D. Where dampproofing interior face of above-grade, exterior [concrete][and][masonry][single-wythe masonry] walls, continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by dampproofing wall before constructing intersecting walls.

3.4 INSTALLATION OF COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING

- A. Concrete Foundations and Parged Masonry Foundation Walls: Apply [two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat][one fibered brush or spray coat at not less than 3 gal./100 sq. ft.][or][one trowel coat at not less than 4 gal./100 sq. ft.].
- B. Unparged Masonry Foundation Walls: Apply [primer and two brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat][primer and one fibered brush or spray coat at not less than 3 gal./100 sq. ft.][or][primer and one trowel coat at not less than 5 gal./100 sq. ft.].
- C. Unexposed Face of Concrete Retaining Walls: Apply one brush or spray coat at not less than 1.25 gal./100 sq. ft..
- D. Unexposed Face of Masonry Retaining Walls: Apply primer and one brush or spray

coat at not less than 1.25 gal./100 sq. ft..

- E. Concrete Backup for Masonry Veneer Assemblies: Apply one brush or spray coat at not less than 1 gal./100 sq. ft..
- F. Masonry Backup for Masonry Veneer Assemblies: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..
- G. Exterior Face of Inner Wythe of Cavity Walls: Apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..
- H. Interior Face of Exterior Concrete Walls: Where above grade and indicated to be furred and finished, apply one brush or spray coat at not less than 1 gal./100 sq. ft..
- I. Interior Face of Exterior Masonry Walls: Where above grade and indicated to be furred and finished, apply primer and one brush or spray coat at not less than 1 gal./100 sq. ft..

3.5 INSTALLATION OF PROTECTION COURSE

- A. Install protection course over completed-and-cured dampproofing. Comply with dampproofing-material and protection-course manufacturers' written instructions for attaching protection course.
 - 1. Support protection course over cured coating with spot application of adhesive type recommended in writing by protection-board manufacturer.
 - 2. Install protection course [on same day][within 24 hours] of dampproofing installation (while coating is tacky) to ensure adhesion.

3.6 INSTALLATION OF DRAINAGE PANELS

- A. Molded-Sheet Drainage Panels: Install panels over completed-and-cured dampproofing, with geotextile facing away from wall substrate, in accordance with manufacturer's written instructions. Use adhesive or another method that does not penetrate dampproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.
 - 1. Install [thermal insulation specified in Section 072100 "Thermal Insulation,"][protection course] before installing drainage panels.
- B. Insulation Drainage Panels: Install panels over completed-and-cured dampproofing. Use adhesive or another method that does not penetrate dampproofing. Cut and fit panels to within 3/4 inch of projections and penetrations.
 - 1. Ensure that drainage channels are aligned and free of obstructions.

3.7 PROTECTION

- A. Protect installed drainage panels from damage due to UV light, harmful weather

exposures, physical abuse, and other causes. Provide temporary coverings where panels are subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

- B. Correct dampproofing that does not comply with requirements; repair substrates and reapply dampproofing.

END OF SECTION 07 11 13

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Extruded polystyrene foam-plastic board insulation.
2. Molded (expanded) polystyrene foam-plastic board insulation.
3. Graphite-polystyrene foam-plastic board insulation.
4. Polyisocyanurate foam-plastic board insulation.
5. Mineral-wool blanket insulation.
6. Rigid vacuum insulation.
7. Glass-wool vacuum insulation.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 061600 "Sheathing" for foam-plastic board sheathing installed directly over wood or steel framing.
3. [Section 071326 "Self-Adhering Sheet Waterproofing"] [Section 071353 "Elastomeric Sheet Waterproofing"] [Section 071354 "Thermoplastic Sheet Waterproofing"] [Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"] [Section 071416 "Cold Fluid-Applied Waterproofing"] for insulated drainage panels installed with plaza deck insulation.
4. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.
5. [Section 070150.19 "Preparation for Reroofing"] [Section 075113 "Built-up Asphalt Roofing"] [Section 075116 "Built-up Coal Tar Roofing"] [Section 075213 "Atactic-Polypropylene (APP) Modified Bituminous Membrane Roofing"] [Section 075216 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing"] [Section 075316 "Chlorosulfonate-Polyethylene (CSPE) Roofing"] [Section 075323 "Ethylene-Propylene-Diene-Monomer (EPDM) Roofing"] [Section 075416 "Ketone Ethylene Ester (KEE) Roofing"] [Section 075419 "Polyvinyl-Chloride (PVC) Roofing"] [Section 075423 "Thermoplastic-Polyolefin (TPO) Roofing"] [Section 075552.13 "Atactic-Polypropylene (APP) Modified Bituminous Protected Membrane Roofing"] [Section 075552.16 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Protected Membrane Roofing"] [Section 075556 "Fluid-Applied Protected Membrane Roofing"] [and] [Section 075700 "Coated Foamed Roofing"] for insulation specified as part of roofing construction.
6. [Section 092300 "Gypsum Plastering"] [Section 092400 "Portland Cement Plastering"] [Section 092613 "Gypsum Veneer Plastering"] [Section 092900 "Gypsum Board"] for sound attenuation blanket used as acoustic insulation.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
 - 1. Third-Party Certifications: For each product.
 - 2. Third-Party Certified Life Cycle Assessment: For each product.

1.3 INFORMATIONAL SUBMITTALS

- A. Installer's Certification: Listing type, manufacturer, and R-value of insulation installed in each element of the building thermal envelope.
 - 1. For blown-in or sprayed fiberglass and cellulosic-fiber loose-fill insulation, indicate initial installed thickness, settled thickness, settled R-value, installed density, coverage area, and number of bags installed.
 - 2. Sign, date, and post the certification in a conspicuous location on Project site.
- B. Product Test Reports: For each product, for tests performed by a qualified testing agency.
- C. Research Reports: For foam-plastic insulation, from ICC-ES.

1.4 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 until just before installation time.
 - 3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Maximum flame-spread and smoke-developed indexes less than [Class A, 25 and 450][Class B, 75 and 450][Class C, 200 and 450] when tested in accordance with ASTM E84.

- B. Fire-Resistance Ratings: Comply with ASTM E119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from listings of another qualified testing agency.
- C. Fire Propagation Characteristics: Passes NFPA 285 testing as part of an approved assembly.
- D. Labeling: Provide identification of mark indicating R-value of each piece of insulation 12 inches and wider in width.
- E. Thermal-Resistance Value (R-Value): [R-value as indicated on Drawings][R-value as indicated below]<Insert R-value> in accordance with ASTM C518.
 - 1. R-Value at <Insert location>: <Insert R-value>.
- F. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.

2.2 EXTRUDED POLYSTYRENE FOAM-PLASTIC BOARD INSULATION (XPS)

- A. Extruded Polystyrene Board Insulation, Type X: ASTM C578, Type X, 15 psi minimum compressive strength; unfaced.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [DiversiFoam Products]
 - b. [DuPont de Nemours, Inc.]
 - c. [MBCI; Cornerstone Building Brands]
 - d. [Owens Corning]
 - e. [The Dow Chemical Company]
 - f. <Insert manufacturer's name>

2.3 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

- A. Polyisocyanurate Board Insulation, Foil Faced: ASTM C1289, foil faced, Type I, Class 1 or 2.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Atlas Molded Products, a division of Atlas Roofing Corporation]
 - b. [Atlas Polyiso Roof and Wall Insulation]

- c. [Carlisle Coatings & Waterproofing Inc]
- d. [DuPont de Nemours, Inc.]
- e. [Elevate; Amrize Building Envelope LLC]
- f. [Hunter Panels; a Carlisle company]
- g. [Johns Manville; a Berkshire Hathaway company]
- h. [Rmax, A Business Unit of Sika Corporation]
- i. <Insert manufacturer's name>

B. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Atlas Polyiso Roof and Wall Insulation]
- b. [Carlisle Coatings & Waterproofing Inc]
- c. [Elevate; Amrize Building Envelope LLC]
- d. [Hunter Panels; a Carlisle company]
- e. [Johns Manville; a Berkshire Hathaway company]
- f. [Rmax, A Business Unit of Sika Corporation]
- g. <Insert manufacturer's name>

2.4 MINERAL-WOOL BLANKET INSULATION

A. Mineral-Wool Blanket Insulation, Unfaced: ASTM C665, Type I (blankets without membrane facing); consisting of fibers; complying with ASTM E136 for combustion characteristics.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Johns Manville; a Berkshire Hathaway company]
- b. [Owens Corning]
- c. [ROCKWOOL]
- d. <Insert manufacturer's name>

B. Mineral-Wool Blanket Insulation, Reinforced-Foil Faced: ASTM C665, Type III (reflective faced); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Johns Manville; a Berkshire Hathaway company]

- b. [Owens Corning]
- c. <Insert manufacturer's name>

2.5 ACCESSORIES

A. Insulation for Miscellaneous Voids:

1. Glass-Fiber Insulation: ASTM C764, Type II, loose fill; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E84.
2. Spray Polyurethane Foam Insulation: ASTM C1029, Type II, closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84.
3. Polyurethane Pour-In-Place Insulation: Closed cell, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E84, specifically formulated for pour-in-place applications.
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [Huntsman Building Solutions]
 - 2) <Insert manufacturer's name>

B. Miscellaneous Application Accessories:

1. Adhesive for Bonding Insulation: Product compatible with insulation and air and water barrier materials, and with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.
2. Crack Sealer: Closed-cell insulating foam in aerosol dispenser recommended in writing by insulation manufacturer for filling gaps in board insulation.
3. Curtain-Wall Insulation Clips: Z-shaped galvanized steel as recommended in writing by insulation manufacturer.
4. Eave Ventilation Troughs: Preformed, rigid fiberboard or plastic sheets designed and sized to fit between roof framing members and to provide ventilation between insulated attic spaces and vented eaves.
5. Detailing Foam Insulation for Voids: Urethane foam complying with AAMA 812, low expansion pressure suitable for filling insulation gaps and voids adjacent to openings to protect against water, air, and sound intrusion.
6. Tapes for Reflective Insulation and Barriers:
 - a. Aluminum-foil tape for repairs or splicing material.
 - b. Double-sided tape for adhering to metal framing or overlapping material.
 - c. Reinforced-foil tape for sealing tears or cuts in sheet vapor barrier.
7. Clip-and-Pin Components:
 - a. Beam/Bar Joist Clips: For beams, bar joists, and Z-type purlins.
 - b. C-Purlin Clips: For C-type purlins.
 - c. Angle Clips: For sidewalks and floors.

- d. Tube Clips: For wood beams and metal tubular framing.
 - e. Locking Washers: Aluminum; white to match reflective bubble insulation facing colors.
8. Wire Mesh Lath Support for Insulation: ASTM C1032.
- a. Material: Woven wire lath 1-1/2-inch hexagonal-shaped mesh with minimum 0.0510-inch- diameter, galvanized-steel wire.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products, applications and applicable codes.
- 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. Install insulation with manufacturer's R-value label exposed after insulation is installed.
- D. Extend insulation to envelop entire area to be insulated. Fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- E. Provide sizes to fit applications and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units unless multiple layers are otherwise shown or required to make up total thickness or to achieve R-value.

3.3 INSTALLATION OF SLAB INSULATION

- A. On vertical slab edge and foundation surfaces, set insulation units using manufacturer's recommended adhesive in accordance with manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of [24 inches][36 inches]<Insert dimension> below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units in accordance with manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of

[24 inches][36 inches]<Insert dimension> in from exterior walls.

3.4 INSTALLATION OF FOUNDATION WALL INSULATION

- A. Butt panels together for tight fit.
- B. Anchor Installation: 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 in accordance with anchor manufacturer's written instructions.
 - 2. Space anchors in accordance with insulation manufacturer's written instructions for insulation type, thickness, and application.
 - 3. Apply insulation standoffs to each spindle to create cavity width indicated on Drawings between concrete substrate and insulation.
 - 4. 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.
 - 5. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.
- C. Adhesive Installation: Install with adhesive or press into tacky waterproofing or dampproofing in accordance with manufacturer's written instructions.

3.5 INSTALLATION OF CAVITY-WALL INSULATION

- A. Foam-Plastic Board Insulation: Install pads of adhesive spaced approximately 24 inches o.c. both ways on inside face and as recommended in writing by manufacturer.
 - 1. Fit courses of insulation between[wall ties and other] obstructions, with edges butted tightly in both directions, and with faces flush.
 - 2. Press units firmly against inside substrates.
 - 3. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."
- B. Cellular-Glass Structural Insulating Blocks:
 - 1. Verify manufacturer-recommended cure time for air and water barrier system and waterproofing before installing structural insulating block.
 - 2. Install a single layer of cellular-glass structural insulating block with facers on top and bottom surfaces fully embedded into mortar set on brick ledge in accordance with manufacturer's written instructions.
 - 3. Install cellular-glass structural insulating block maximum sizes to minimize joints.
 - 4. Locate joints square to framing members. Do not cantilever cellular-glass structural insulating block.
 - 5. Butt joints of cellular-glass structural insulating block with no gaps or mortar between joints.

6. Insulation board edges are to be butted together tightly and fit around openings and penetrations. Install square edges to fit square and tight.
 7. Extend insulation in single course to cover entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Do not drill.
- C. Mineral-Wool Board Insulation: Install insulation fasteners 4 inches from each corner of board insulation, at center of board, and as recommended by manufacturer.
1. Fit courses of insulation between[masonry wall ties and other] obstructions, with edges butted tightly in both directions, and with faces flush.
 2. Press units firmly against inside substrates.

3.6 INSTALLATION OF INSULATION IN FRAMED CONSTRUCTION

- A. Blanket Insulation: Install in cavities formed by framing members in accordance with the following requirements:
1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 4. Attics: Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
 5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 6. Where glass-fiber blankets are indicated for sound attenuation above ceilings, install unfaced blanket insulation over ceiling area in thickness indicated. Where partitions occur, extend insulation up either side of partition.
 7. For wood-framed construction, install blankets in accordance with ASTM C1320 and as follows:
 - a. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
 8. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward [exterior of construction][interior of construction][as indicated on Drawings].
 - b. Interior Walls: Set units with facing placed [as indicated on Drawings][toward areas of high humidity]<Insert location>.
- B. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Glass-Fiber Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft..
 2. Detailing Foam Insulation for Voids: Apply in accordance with manufacturer's written instructions.
- C. Loose-Fill Insulation: Apply in accordance with ASTM C1015 and manufacturer's written instructions.
1. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
 2. For cellulosic-fiber loose-fill insulation, comply with CIMA's Technical Bulletin #2, "Standard Practice for Installing Cellulose Building Insulation."
- D. Spray-Applied Cellulosic Insulation: Apply spray-applied insulation in accordance with manufacturer's written instructions.
1. 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.
 2. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.

3.7 INSTALLATION OF BOARD INSULATION

- A. Install board insulation in accordance with manufacturer's written instructions per project applications and conditions.

3.8 INSTALLATION OF REFLECTIVE AND RADIANT BARRIERS INSULATION

- A. Install sheet reflective insulation in accordance with ASTM C727.
- B. Install sheet radiant barriers in accordance with ASTM C1744.
- C. Install interior radiation control coating system in accordance with ASTM C1321.

3.9 INSTALLATION OF VACUUM INSULATION

- A. Install vacuum insulation panels in accordance with manufacturer's written instructions.

3.10 PROTECTION

- A. Protect installed insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- B. 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 29 - TERRA COTTA RAINSCREEN PANEL SYSTEM

PART 1 - GENERAL

1.1 SUMMARY OF WORK

- A. Section includes: Exterior wall cladding system consisting of flat exterior grade extruded terra cotta panels installed on an aluminum attachment substructure.
- B. Related sections: Section 05400 - Cold Formed Metal Framing
 - 1. Section 06165 - Air Barrier over exterior sheathing
 - 2. Section 07210 - Building Insulation: [Rigid board] thermal insulation installed behind the extruded terra cotta cladding system.
 - 3. Section 07270 - Air Barriers: Sheet air infiltration barrier installed in cavity behind extruded terra cotta cladding panels.
 - 4. Section 07600 - Flashing and Sheet Metal: Sheet metal air cavity flashings, wall transitions, [sills,] [trim,] [parapet cap,] and other sheet metal components.

1.2 REFERENCES

- A. TEST Standards:
 - 1. ASTM C-67 – Test method for Structural Performance of Terracotta Panels
 - 2. IBC 1403.2 Reference Standard for selection of Weather Resistive Barriers
 - 3. ASTM E330-02 – Test method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference (Transverse Load Test)
 - 4. ASTM E331-00 – Test method for Water Penetration of Exterior Windows, Skylights, Doors and Curtainwall by Uniform Static Air Pressure Difference
 - 5. AAMA 509 Test Protocol for Drained and Back Ventilated Rainscreens

1.3 DEFINITIONS

- A. Architectural grade extruded terra cotta panels, extruded aluminum or stainless-steel support rails and fixing components designed with adequate durability.

1.4 DESIGN REQUIREMENTS

- A. Design and install terra cotta cladding and attachment system to:
1. Provide in conjunction with wall substrate and air barrier a weather tight wall assembly utilizing a drained and back ventilated assembly.
 2. System design shall be single-source responsibility by the cladding supplier. All design criteria shall be project specific in accordance with the requirements of terra cotta cladding and support system supplier (CLADDING CORP) – Phone: (888) 826-8453. Products provided must conform to the design intent shown.
 - a. PANEL SYSTEM: Drained and Back Ventilated Rainscreen Design. System shall drain water and condensation to exterior. A complete pre-engineered system including but not limited to terra cotta cladding panels, aluminum metal support structure by CLADDING CORP, closure pieces, trim and flashing. Wall panels shall be removable. The panels shall be secured to an aluminum or steel support structure, which secures to a structurally suitable substrate. System must incorporate independent, non-continuous wall brackets for attachment to substrate to meet continuous insulation (ci) requirements when exterior insulation is incorporated into cladding cavity design. Membrane should be visually inspected for breaches (and repaired as recommended by membrane manufacturer) prior to installation of support system.
 - b. JOINTS: Shall be dry and un-caulked
 - c. METAL FLASHING: Provide metal flashing for a proper water managed assembly, to direct condensation and water infiltration within the wall to weeping points. Coordinate details and installation with Air and Water Barrier provided with Section 07270.
 - d. Design Modifications – shall be provided only as necessary to satisfy as-built conditions and to meet performance requirements. Significant system and aesthetic design shall be requested in writing to architect 10 days prior to bid date.
 3. Material supplier shall be responsible for engineering system per architectural design criteria and performance requirements.

1.5 PERFORMANCE REQUIREMENTS

- A. Design and install terra cotta cladding and attachment system to:
1. Material performance requirements for terra cotta tiles:

- a. Fabrication and weight tolerances per ASTM C-67 Section 13.1
 - b. Water Absorption: Test according to ASTM C-67 Section 8.
Water absorption shall be 1% to 8% depending upon color.
 - c. Modulus of Rupture: Test according to ASTM C-67 Section 6.1.
Specimen shall exhibit average values of 1800 – 2500 psi.
 - d. Compressive Strength: Test according to ASTM C-67 Section 7.1.
Specimen shall exhibit average values of 18000 – 24000 psi.
 - e. Efflorescence: Test according to ASTM C-67 Section 11.1.
Specimen shall show no signs of efflorescence.
 - f. Freeze Thaw 100 Cycles per ASTM C-67 Section 9.1. Show no signs of cracking.
2. Withstand design loads, as required by applicable codes for project location, as follows:
 - a. Maximum panel deflection: $L/300$ of span or less of span when tested in accordance with positive and negative pressures and as required to prevent cracking or damage to panel facing.
3. Comply with applicable seismic requirements for project location in Seismic Zone as indicated in structural drawings as defined by International Code Conference (ICC).
4. Adequately resist wind forces and uplift for project location with minimum of [] [PSF] [kilopascals] [] for wall surface and [] [PSF] [kilopascals] for parapet and corner panels tested in accordance with ASTM E330.
5. Accommodate movement of cladding components without undue stress on fasteners or other detrimental effects, when subjected to seasonal temperature range of:
 - a. Ambient: [120 degrees F] [67 degrees C].
 - b. Cladding surface: [180 degrees F] [100 degrees C].
6. Accommodate tolerances of support structure.
7. Condensation: System shall accommodate positive drainage for moisture entering or condensation occurring within panel system.
 - a. Design drainage system for 100 years rain cycle
5. Flatness: System shall be flat with no noticeable warping, buckling, deflections or other surface irregularities.

1.6 CONTINUOUS INSULATION (CI). System shall comply with ASHRAE 90.1-2010 thermal performance requirements. System shall:

- A. Be manufactured from AL6063-T6 extruded aluminum components.
- B. Shall be designed with independent non-continuous wall brackets to ensure optimal thermal and moisture performance when required to provide outboard insulation (CI) within cladding cavity.
- C. System shall incorporate thermally broken wall brackets to reduce thermal drops/gains through system components.
- D. System shall use stainless steel wall anchors.
- E. Provide a thermal analysis to show final U-value of cladding assembly to accommodate ASHRAE 90.1-2010 performance requirements.

1.7 SUBMITTALS

A. Provide in accordance with Section 01330 - Submittal Procedures:

- 1. Product data describing materials and fabrication for extruded terra cotta panels.
- 2. Product data describing materials and fabrication for aluminum attachment system and components.
- 3. Shop drawings showing:
 - a. Layout, profiles and dimensions for panels, product components, edge conditions, special shapes, and trim pieces.
 - b. Installation details: attachment methods, fasteners, joints, corners, openings, intersections with adjacent materials, flashings, closures, trim, and other critical conditions.
 - c. Layout of terra cotta panels on wall and locations of special pieces and trim.
- 4. Signed and sealed structural calculations by engineer licensed in state and local jurisdiction.
- 5. Copies of certificates, reports, and other data showing compliance with design and performance requirements specified in Paragraph [1.4].
- 6. Copy of written approval by fastener supplier of the use of selected screws confirming use in a drained and back-ventilated (D&BV) rainscreen wall assembly.

7. Samples:

- a. One 8 inches x 8 inches terra cotta panel in selected colorS and surface finish.
 - b. 3 inches [76 mm] minimum length of attachment profile.
 - d. Typical Support brackets and anchors
 - e. Typical exposed fasteners
8. Manufacturer's installation and maintenance instructions.
9. Copy of warranty required by Paragraph [1.11] for review by Architect.

1.8 QUALITY ASSURANCE

- A. System Manufacturer's Qualifications: Provide exterior wall system manufactured by a firm experienced in manufacturing systems that are like those indicated for this project and have a record of successful in-service performance with minimum 10 years' experience.
- B. Installer qualifications: Company experienced in installing exterior wall cladding systems and acceptable to extruded terra cotta panel and aluminum support system suppliers with minimum 5 years' experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Prior to shipping, pack, and crate terra cotta panel system components to prevent damage during transit and storage. During transport, handle the panels with special care taken not to damage the edges of the panels.
- B. Inspect terra cotta panels and aluminum attachment components immediately upon delivery at site. Notify manufacturer of damage.
- C. Follow manufacturer's instructions for storage of terra cotta panels. Keep pieces in original packing material until ready to install. Remove transport protection films from both sides of the panels at the same time.

1.10 WARRANTY

- A. Provide Manufacturer's standard 10-year warranty for terra cotta panels.

1.11 EXTRA MATERIALS

- A. ATTIC STOCK: Provide in accordance with Section 01780 - Closeout Submittals: [Quantity as defined by Architect/Owner]. **10 DEEP RED PANELS, 2 OYSTER PANELS**
- B. Extra panels shall be from same manufacturing lot as installed panels.

PART 2 - PRODUCTS

2.1 ACCEPTABLE SUPPLIERS

- A. TERRA⁵ Terracotta by Cladding Corp (www.claddingcorp.com) Phone: (888) 826-8453
- B. Cladding Panel Type – TC30
- C. Panel Thickness – TC 30 = 30mm (1.18in)
- D. Color as selected by Architect in manufacturer's standard color range Deep Red & Oyster
- E. Cladding Module Size (to centerline of joints):
HGT: 400mm x LENGTH: 1515mm
- F. Or equal substitutions are allowed per Substitution Specification Section.

2.2 PANEL SUBFRAMING SYSTEM

- A. ECO Cladding Sub framing System Supplied by Cladding Corp. (www.ecocladding.com)
Phone: (888) 826-8453
ECO Cladding Vci.46 Vertical brackets and L profiles, horizontal rail and clip attachment system. System is self-shimming to accommodate out-of-plumb conditions. For use with portrait or landscape tile orientation. Joint profiles optional for portrait tile, required for landscape tile.
- B. Or equal substitutions are allowed per Substitution Specification Section.

2.2 SUPPORT COMPONENTS AND ACCESSORIES

A. Metal Support Structure:

1. Support Bracket – Vci / Hci – Non-continuous bracket assembly that anchors directly to wall substrate allowing for continuous insulation (ci) within cladding cavity and supports L/T profile.
2. L/T Profile – shelf shimming extrusions that fastens into open end of Vci / Hci and supports Rail Profile
3. Tile Attachment Component
 - i. Horizontal rail profiles (Vci.46) and clips
4. Fasteners: Corrosion resistant fasteners and anchors of type, size, and spacing required for type of substrate and Project conditions, to meet performance requirements specified in Paragraph [1.4], and as indicated in design calculations and shop drawings. Fastener Manufacturer to supply written approval of the use of selected screws confirming use in a drained and back-ventilated (D&BV) rainscreen wall assembly.
5. Joints Closures (if required) – roll formed/brake shape aluminum painted black or extruded black PVC closure pieces inserted into open joint condition to protect against direct rain penetration into cavity and protection of membrane from UV exposure.

B. Sheet metal: Provide sheet metal flashings and trim as required for cladding system in accordance with Section 07600 - Flashing and Sheet Metal.

C. Corner Conditions

1. Outside Tile Corner Conditions shall be: **Butt End**,
2. Corner closure profiles **[are not]** to be included.

PART 3 - EXECUTION

3.1 INSPECTION

- #### A. Examine walls to receive cladding system. Ensure substrate is structurally sound, clean, and free of contaminants, which could inhibit bond of air barrier.
1. Maximum substrate/studwall deflection: L/300 or as recommended by

code and architect per the guidelines of our manufacturer's maximum system deflection.

2. Maximum substrate surface variation: [1/8 inch in 10 feet] [3 mm in 3 m].
 3. Concrete: Verify cast-in-place concrete walls have cured 30 days minimum. [Ensure inserts for attachment of cladding system are accurately positioned and properly embedded.]
 4. Stud construction with [gypsum sheathing] Verify stud framing is adequately braced without deflection and sheathing is properly secured with edges over firm bearing. Ensure proper framing and supports are provided and located for secure attachment of support rails.
- B. Do not proceed with cladding installation until deficiencies have been addressed.

3.2 PREPARATION

- A. Install assembly of thermal insulation, furring, and sheathing as specified in Section 07210 - Building Insulation and detailed on Drawings and approved shop drawings.
- B. Air barrier: Install air barrier to [wall substrate] [wall sheathing] as specified in Section 07270 - Air Barriers and detailed on Drawings and approved shop drawings. Install horizontally starting at bottom of wall. Do not leave air barrier membrane exposed for lengthy period. Exercise care not to puncture or tear barrier with subsequent cladding operations.
- C. Flashings: Install sheet metal flashings, pressure compartment dividers, and trim as specified in Section 07600 - Flashing and Sheet Metal and as positioned and detailed on Drawings and approved shop drawings. Ensure flashings at bottom of wall and pressure compartments properly drain water from air cavity to exterior through weep holes. Turn up flashings [4 inches] [102 mm] minimum and seal to substrate. Lap flashing end joints [6 inches] [152 mm] and seal watertight.

3.3 CLADDING INSTALLATION

- A. Install cladding in accordance with manufacturer's instructions and approved shop drawings.
- B. Establish level lines for panel coursing and positioning of Vci / Hci / Eci Brackets/support rails.

- C. Vci / Hci / Eci Brackets/Support rails: Attach Brackets/rails with engineered fasteners and anchors to accomplish performance requirements specified in Paragraph [1.4].
 - 1. Attach brackets/rails to substrate at a distance recommended by CLADDING CORP in accordance with lateral loads and system dead load requirements or as shown on drawings.
 - 2. Provide 1 to 2 inches [25 to 51 mm] space between ends of adjacent rails.
- D. Extruded Terra Cotta Panels: Starting at bottom of wall, attach panels to horizontal/ vertical aluminum profile and install sequentially up the wall.
 - 1. Layout work to avoid or minimize cuts. Site cut tiles using power saw with appropriate blade type to prevent broken corners, edges, and chips.
 - 2. Install terra cotta panels with appropriate joint layout and configuration. Vertical and horizontal joints shall be open approximately 3/16 inch [5 mm] wide.
 - 3. Tolerances: Shim and align terra cotta panels to provide these tolerances:
 - a. Deviations from level or plumb alignment: 1/4 inch in 20 feet [6 mm in 6 m] maximum, non-accumulative.

3.4 CLEANING AND PROTECTION

- A. Remove and replace broken, chipped, stained, or otherwise damaged panels.
- B. Immediately after installing, wipe down work. Do not use wire brushes, metallic tools, or abrasives for cleaning.
- C. Protect cladding from roof run-off, splashed water, mud, sealants, bitumen, and other contaminants from remaining construction activities.
- D. Without damaging completed work, provide protective boards at exposed external corners, which may be damaged by construction activities.

END OF SECTION 074229

SECTION 07 42 33 - EXTERIOR SOLID PHENOLIC RAIN SCREEN PANELS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. Work of this Section, as shown or specified, shall be in accordance with the requirements of the Contract Documents.

1.2 SECTION INCLUDES

- A. The Work of this Section includes all labor, materials, equipment, and services necessary to complete the solid phenolic rainscreen panels and accessories as shown on the drawings and/or specified herein, including, but not necessarily limited to, the following:
 - 1. High-pressure laminate panels with solid phenolic polyurethane resin faces used at walls and soffits.
 - 2. Supporting substructure which is part of the rainscreen system design.
 - 3. Accessories, including anchors and attachments.

1.3 RELATED SECTIONS

- A. Cold-Formed Metal Framing - Section 054000.
- B. Rough Carpentry – Section 061000 for in wall blocking as needed.
- C. Thermal Insulation - Section 072100.
- D. Air Barrier - Section 072700.

1.4 SYSTEM DESCRIPTION

- A. Exterior Rainscreen Assembly: Solid phenolic core, fire retardant exterior grade rainscreen wall panels, aluminum substructure, attachment system components, air/vapor barrier membrane, continuous exterior insulation, and all accessories necessary for a complete rear-ventilated, weathertight exterior rainscreen wall system. Furnish fastenings and flashings as required to complete rainscreen system.

1.5 PERFORMANCE CRITERIA

- A. Performance Requirements: Provide panels that have been manufactured, fabricated and installed to maintain performance criteria stated by manufacturer, without defects, damage or failure.
- B. Structural Design: Design calculations certified by a registered professional engineer licensed in the State of PA shall be submitted to verify load carrying capability of panel system using performance requirements and design criteria as indicated. Panel system shall be capable of resisting a minimum positive and negative wind load per ASCE-7 or building code, whichever is greater.

- C. Deflection Limits: Aluminum support structure and exterior phenolic rainscreen panel system shall be designed in accordance with the Manufacturer's recommended maximum deflection when tested under positive and negative design wind gust loads and shall withstand wind gust loads with horizontal deflections no greater than the Manufacturer's allowable span, based on current wind load tables.
- D. Thermal Movements: Exterior solid phenolic rainscreen panel system shall allow for thermal movements from ambient air, surface temperature changes and relative humidity preventing buckling, opening of joints, over-stressing of components, failure of connections and other detrimental effects. Base calculations on surface temperature changes of materials due to both solar heat gain and nighttime sky heat loss.
 - 1. Panel shall remain stable for temperature Change (Range): -112 deg. F, ambient: 356 deg. F, material surfaces.
- E. Support Structure: Provide aluminum support structure capable of the following:
 - 1. Design and install aluminum support structure to accommodate expected construction tolerances and misalignment, deflection of building structural components, and openings in the building enclosure as designed.
- F. Vertical and Lateral Fire Propagation Test Characteristics: The exterior wall assembly may be required to comply with NFPA 285 "Standard Method of Test for the Evaluation of Flammability Characteristics of Exterior Nonload-bearing Wall Assemblies Containing Combustible Components." The base wall, stud cavity insulation, wall sheathing, air barrier, continuous insulation and exterior cladding are components that are required to be evaluated as part of this specific assembly test. The basis of design product listed herein is a component of the design test assembly selected by the Architect.

1.6 SUBMITTALS

- A. Product Data: For each type of product indicated. Include Manufacturer's written installation instructions, including recommendations for evaluating, preparing, and treating substrate, rainscreen panel technical data, material descriptions, and finishes and tested physical and performance properties.
- B. Shop Drawings: Show fabrication and installation layouts of solid phenolic exterior rainscreen panel, details of aluminum support structure attachment and wall structure conditions, anchorages for aluminum support structure, attachment system for panels, allowances for thermal expansion, trim, closures, flashings, corner conditions, and accessories as required or specified by the architect, and all special job specific details.
- C. Samples: Submit selection and verification samples for finishes, colors and textures of panel material. For exposed fastening systems submit color matched exterior stainless steel Torx head fasteners for each color specified. If riveted fastening is selected by architect provide color matched rivets for each panel color specified.
- D. Quality Assurance: Submit the following:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.

- a. Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
2. Manufacturer's Instructions: Manufacturer's installation instructions.
3. Manufacturer's Field Reports: Manufacturer's field reports specified herein.
- E. Closeout Submittals: Submit the following:
 1. Operation and Maintenance Data: Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
 2. Warranty: Warranty documents specified herein.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: Installer shall be approved by the manufacturer and have a minimum of five (5) years of experience in performing work of similar type and scope.
- B. Fabricator Qualifications: A shop that employs skilled workers who custom fabricate solid phenolic or similar exterior rainscreen wall panel systems to those specified herein and is approved by the manufacturer. If shop drawings are required for the project the shop drawings are to be drawn and coordinated by the approved fabrication company.
- C. Pre-Installation Conference: Conduct pre-installation conference at Project site prior to commencing construction of mock-up specified herein to verify Project requirements.
 1. Review solid phenolic rainscreen panel installation requirements including substrate surface preparation, environmental or site limitations, typical details including attachment and trims, Manufacturer's recommended installation procedures, coordination with adjacent trades, testing and inspection procedures (if any), protection of work and repair procedures.
 2. Ensure all sub-trades interfacing with or affected by the construction of the solid phenolic rainscreen wall panel system are present, including Architect, General Contractor, solid phenolic panel Manufacturers Representative, mockup and commissioning testing agencies, air barrier installation contractor, exterior insulation installer, electrical installer and any other installer whose work interfaces with or affects the solid phenolic rainscreen wall panels.
- D. Source Limitations: Obtain solid phenolic rainscreen wall panels and all auxiliary materials from a single source Manufacturer who has a minimum of 25 years of experience in the manufacturing of exterior high pressure phenolic rainscreen panels or an accessory Manufacturer who is certified by the solid phenolic rainscreen panel Manufacturer. Panels to be manufactured by a Manufacturer with ISO9001 and ISO14001 certification of standards.

1.8 MOCK UP

- A. Before construction of the exterior rainscreen envelope, construct a mock-up to verify selections made under approved submittals and to demonstrate typical joints, surface

finish, texture, tolerances, attachments to building structure, methods of installation, connections to adjacent building enclosure materials, and standard and quality of workmanship. Build mock-up to comply with the following requirements using materials indicated for completion of the Work:

1. Mock-up shall be constructed in concert with Mock-up Section requirements.
2. Demonstrate continuity, air, and water tightness of air and water barrier and installation and attachment of continuous exterior insulation
3. If Architect determines that the field constructed mock-up does not meet Project requirements, reinstall mock-up until approved.
4. Retain and maintain the approved field mockup during construction in an undisturbed condition as a standard for judging the completed exterior solid phenolic rainscreen panel system. At the architect's discretion, the mock-up may be part of the completed Work.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Storage and Protection: Store materials protected from exposure to harmful weather conditions, at temperature and humidity conditions recommended by manufacturer. Comply with manufacturer's written handling and storage guidelines.

1.10 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.

1.11 WARRANTY

- A. Submit Manufacturer's standard 10 year limited warranty covering defects in material or manufacturing quality, including color fastness warranty. Warranty to include labor for removal, replacement and reinstallation of defective material.
- B. Warranty is only available when solid phenolic rainscreen panels are installed and fabricated by an installation contractor that has been approved by the Manufacturer and has followed the recommended guidelines of the Manufacturer, and has been signed and dated by the appropriate parties listed on the warranty registration form.

PART 2 PRODUCTS

2.1 SOLID PHENOLIC WALL PANELS

- A. Basis of Design: Provide "Max Compact Exterior F-Quality" panels as manufactured by FunderMax GmbH / FunderMax North America, 9401-P Southern Pine Blvd, Charlotte NC 28273. A list of local fabricators or installers that comply with this specification section may be requested.

B. Equal substitutions will be considered in coordination with Substitution specification.

1. Material: Fire-retardant solid phenolic panels with standard brown core comprised of kraft paper harvested from FSC certified forests and thermosetting resins. Dry Formed (DF) or Natural Fiber Core (NFC) products will not be accepted.
 - a. Rainscreen Panel Surface: NT
 - b. Modulus of Elasticity: 1,300,000-psi minimum.
 - c. Weight: 8mm 2.4 lbs./SF; 10mm, 3 lbs./SF; 12mm, 3.9 lbs./SF
 - d. Tensile Strength: 11,000-PSI, minimum.
 - e. Flexural Strength: 13,000-PSI, minimum.
 - f. Surface Impact Resistance: < 8 per EN ISO 178
 - g. Scratch Resistance: > 3 /4 N per EN 438:6
 - h. Optical Properties: Color Stability Gray Scale > 4 per ISO 4892-2, EN 20105-A02.
 - i. Panels shall be hail impact resistant with no breakage per Austrian APBIC Standard, Association of Public Building Insurance Companies. Equivalent test standard 70mm ice ball at a velocity of 30 meters/second (67.10 mph) without breakage, tearing or discoloration.
 - j. Panels shall be FSC Certified
 - k. Panels shall have an Environmental Product Declaration (EPD) Report.
 - l. Panels shall have a Health Product Declaration (HPD)
1. Colors: Submit manufacturer's standard colors for selection by Architect and or individual Décor option.
 - a. Color: Enigma Oak Woodgrains
2. Finish: As selected by the Architect.[NT]
3. Panel Core: Brown
4. Rainscreen Panel Thickness: [(10mm)]

C. Panel Tolerance:

1. Thickness: 1/32", maximum.
2. Length: 1/4", maximum.
3. Width: 1/4", maximum.
4. Non-porous homogenous surface and edges which do not require sealing after cutting or drilling.

2.2 SUPPORT STRUCTURE

A. Support systems

1. Exposed Fastening Type using extruded aluminum profiles, clips, closures, fasteners and Tees as indicated on the architectural drawings. [8mm] [10mm]

- a. Extruded 6063T5 or 6063T6 Alloy Aluminum which may be mill finish or painted, or powder coated black for the type of use indicated on the project Drawings.
- b. Fasteners: SFS TWS D13 screws or SFS AP 16 rivets, color matched, as indicated on the architectural drawings.

2.3 SOURCE QUALITY CONTROL:

- A. Panels shall be specifically designed for exterior rainscreen wall applications. Fabricated panels shall comply with all current codes and regulations for the Project. Panels shall have uniform thickness (+0.03") and flatness (maximum difference of 0.03") for a 10 foot span.
- B. Flame Spread: Panels to conform to ASTM E-84 for Class A fire rating with a Flame spread index of less than 10 and Smoke development index of less than 450.
- C. NFPA-268 Surface Ignition test, pass.
- D. Ignition Temperature: Greater than 650 degrees Fahrenheit above ambient, ASTM D-1929
- E. UV stable surface of Acrylic-PUR resin coating of 100 micron thickness or greater with color stability > 4 on Gray Scale.
- F. When required by code, the assembly shall meet the performance requirements of NFPA 285. Exposed fastening assemblies listed in ICC ESR #3340 or Concealed fastening assemblies with Engineering Evaluation report(s) from a nationally recognized fire protection consulting firm. Any variations must be approved by the local code official.

2.4 FABRICATION

- A. Fabricate solid phenolic wall panels and accessory items in accordance with manufacturer's written recommendations and approved submittals.
- B. Fabricate panels with a minimum of 1mm micro bevel on the exposed face.
- C. Comply with indicated profiles and within dimensional and structural requirements. Fabricator shop drawings to comply with manufacturer's written guidelines for ventilation of the rainscreen façade.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, product installation instructions and published technical guidelines.

3.2 EXAMINATION

- A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation in accordance with manufacturer's instructions.
- B. Verify that air and weather resistant barrier has been installed over structural sheathing in accordance with air barrier Manufacturer's recommended installation instructions and terminated properly at openings to prevent air infiltration or water penetration.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. Install wall panels plumb and level and accurately spaced in accordance with manufacturer's recommendations and approved submittals and Shop Drawings.
- B. Fasten solid phenolic wall panels to supporting aluminum substructure with fasteners approved for use by solid phenolic rainscreen manufacturer for use with adjoining construction and in accordance with approved Shop Drawings.
- C. Accessory Items: Install corner profiles, gaskets and trim with fasteners and adhesive appropriate for use with adjoining construction as indicated on approved Shop Drawings and as recommended by manufacturer.
- D. Do not apply sealant to solid phenolic rainscreen panel joinery unless otherwise indicated on approved Shop Drawings or in accordance with the Manufacturer's recommended installation instructions.

3.4 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 off site.

3.5 PROTECTION

- A. Protection: Protect installed product and finish surfaces from damage during construction.

END OF SECTION

SECTION 07 46 46 - FIBER CEMENT SIDING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Fiber cement panels of the following types:
 - 1. Surface colored high-density fiber cement panels
- B. Cladding attachment system.

1.2 RELATED SECTIONS

- A. Section 05400 - Cold-Formed Metal Framing.
- B. Section 06100 - Rough Carpentry.
- C. Section 07210 - Building Insulation.
- D. Section 07250 - Air Barriers.

1.3 REFERENCES

References are product specific. See specific product in Part 2 to see which testing applies.

- A. ASTM - ASTM International:
 - 1. ASTM C1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
 - 2. ASTM C1186 - Standard Specification for Flat Fiber-Cement Sheets.
 - 3. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 4. ASTM E136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750-degree C. Determination of Non-Combustibility.
- B. ICC – International Code Council
 - 1. ICC-ES Evaluation Report

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300 - Administrative Requirements.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of non-standard applications of fiber cement materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Attachment System Engineered Drawings:
 - 1. Provide engineered design for attachment and back-up framing to support exterior cladding.
 - 2. Provide Installation drawings and details.

- E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Color Evaluation: Insignificant change after 3000 hours of QUV test (EN 20105).
- C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish areas designated by Architect in situ.
 - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
 - 3. Remodel mock-up area as required to produce acceptable work.

1.6 FABRICATION, DELIVERY, STORAGE, AND HANDLING

- A. All cladding materials to be finished and fabricated in the United States with backup inventory in residence in the United States to support job in-progress.
- B. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommended guidelines.
- C. All cladding materials to be fabricated to end use panel sizes.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

- A. Warranty: Manufacturer warrants that its products are manufactured in accordance with its applicable material specifications and are free from defects in materials and workmanship.
 - 1. Only products that are installed and used in accordance with applicable manufacturer's instructions and specifications are warranted.
 - 2. The warranty is applicable only to claims made in writing and received by the manufacturer within thirty days after the defect was discovered and within ten years after the date of the shipment of the product by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER/SUPPLIER

- A. Basis of Design: James Hardie, or equal
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SURFACE COLORED AND TEXTURED HIGH DENSITY FIBER CEMENT PANELS

- A. Surface Colored and Textured Fiber Cement Panels:
 - 1. Product: Cover as manufactured/supplied by James Hardie.
 - a. Application: Exterior soffit condition siding panels

- b. Thickness: 5/16 inch (8 mm).
- c. Finish: Smooth, natural gray baseboard fully covered with an opaque, water-based acrylic coating which is resistant to moss, algae, staining and surface dirt.
- d. Physical Characteristics: ASTM C1185/C1186, EN 12467 'Fiber-cement flat sheets'.
 - 1) Density Dry: 1770 kg/m³.
 - 2) Bending strength at with grain: 39.0 MPa.
 - 3) Bending strength at across grain: 24.8 MPa.
 - 4) Modulus of elasticity at with grain: greater than 16.3 GPa.
 - 5) Modulus of elasticity at across grain: greater than 13.8 GPa.
 - 6) Durability classification (EN 12467): Category A.
 - 7) Strength classification (EN 12467): Class 4.
 - 8) Fire reaction (EN 13501-1): A2-s1-d0.
 - 9) Warm water test: Ok.
 - 10) Soak dry test: Ok.
 - 11) Freeze thaw test: greater than 100 cycles.
 - 12) Thermal conductivity e: 0.5 W/mK.
- e. Fire Testing:
 - 1) ASTM E84
 - 2) ASTM E136

2.3 MISCELLANEOUS CLADDING MATERIALS

- A. Aluminum Joint Closures and Decorative Corner Profiles: Manufacturer's standard products as detailed. Maximum thickness of finishing profile to be 0.8 mm or 21-gauge.

2.4 ATTACHMENT SYSTEMS

- A. Attachment System, Steel Supporting Members:
 - 1. Product: "Hat" profiles supplied by others.
 - a. Material: minimum 20-gauge, minimum G90 coating.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions and approved submittals.

- B. For exterior applications, comply with local codes and structural engineer's fastening calculations along with manufacturer's recommendations for fastener spacing.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 07-5423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING

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. Substrate board.
2. Roof insulation.
3. Cover board.
4. Roof Membrane
5. Adhesives
6. Walkways
7. Metal flashings

- B. Related Requirements:

1. Section 06-1053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Section 07-2100 "Thermal Insulation" for insulation beneath the roof deck.
3. Section 07-6200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 07-7100 "Roof Specialties"
5. Section 07-9200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

- A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

1.4 PREINSTALLATION MEETINGS

- A. Preliminary Roofing Conference: Before starting roof deck construction, conduct conference at Project site.
 1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work

interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review deck substrate requirements for conditions and finishes, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

B. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:
1. Layout and thickness of insulation.
 2. Base flashings and membrane termination details.

3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products:

1. Roof membrane and flashings, of color required.
2. Walkway pads or rolls, of color required.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installer, manufacturer and third party inspector

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
 - a. Submit evidence of compliance with performance requirements.
2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field Test Reports:

1. Concrete internal relative humidity test reports.
2. Fastener-pullout test results and manufacturer's revised requirements for fastener patterns.

F. Field quality-control reports.

G. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer that is UL listed and listed in FM Approvals' RoofNav for roofing system identical to that used for this Project.
- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. Installer Qualifications: Qualified firm to have a minimum of five (5) years' experience under the same corporation.
- D. Technical Inspector Qualifications: Contractor will engage a qualified third party technical representative, not employed by the roofing manufacturer, for the entire length of the roof project. Minimum site representation is two (2) full working days per every five (5) full working days. Third party technical representative inspector shall perform roof inspections and tests to prepare daily inspections and test reports.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.
- B. Only as much of the new roofing as can be made weathertight each day, including all flashing and detail work, shall be installed. All seams shall be heat welded before leaving the job site that day.

- C. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, cover boards, vapor retarder, substrate board, roof pavers, and other components of roofing system.
 - 2. Warranty Period: Twenty **(20)** years from date of Substantial Completion.
- B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, vapor retarders, roof pavers, and walkway products, for the following warranty period:
 - 1. Warranty Period: Two **(2)** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.
 - 1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
 - 2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
- B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.
- C. Wind Uplift Resistance: System shall be designed to meet the minimum wind design requirements of the most recent version of ASCE 7.
- D. ENERGY STAR Listing: Roofing system shall be listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low slope roof products.
- E. Energy Performance: Roofing system shall have an initial solar reflectance of not less than 0.70 and an emissivity of not less than 0.75 when tested according to CRRC-1.

- F. Exterior Fire-Test Exposure: ASTM E108 or UL 790, **Class A**; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- G. Fire-Resistance Ratings: Comply with fire-resistance-rated assembly designs indicated. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

- A. TPO Sheet: ASTM D6878/D6878M, internally fabric- or scrim-reinforced, TPO sheet.
 - 1. Source Limitations: Obtain components for roofing system from one of the following approved manufacturers:
 - a. Carlisle SynTec Inc
 - b. Firestone Building Products
 - c. Johns Mansville, JM TPO-60
 - 2. Thickness: 60 mils, nominal.
 - 3. Exposed Face Color: Gray

2.3 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.
 - 1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55mils thick, minimum, of same color as TPO sheet.
- C. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.
- D. Roof Vents: As recommended by roof membrane manufacturer.
 - 1. Size: Not less than **4-inch** diameter.
- E. Bonding Adhesive: Manufacturer's standard
- F. Slip Sheet: ASTM D2178/D2178M, Type IV; glass fiber; asphalt-impregnated felt.
- G. Slip Sheet: Manufacturer's standard, of thickness required for application.
- H. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately **1 by 1/8 inch** thick; with anchors.
- I. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately **1 inch wide by 0.05 inch thick**, prepunched.

- J. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.
- K. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

- A. Substrate Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board or ASTM C1278/C1278M, fiber-reinforced gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following product or equivalent:
 - a. Dens Deck by Georgia-Pacific Gypsum LLC.
 - 2. Thickness: 1/2 inch
 - 3. Surface Finish: Factory primed.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing system manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated and that produce FM Global-approved roof insulation.
- B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 2, Grade 2 coated glass facer on both major surfaces.
 - 1. Subject to compliance with requirements, provide product that is approved by the membrane manufacturer.
 - 2. Compressive Strength: 20 psi.
 - 3. Thickness:
 - a. Flat roof, not over pool area (indicated on details/drawings): 6" Total minimum thickness.
- C. Tapered Insulation: Provide factory-tapered insulation boards.
 - 1. Material: Match roof insulation.
 - 2. Minimum Thickness: 1/2 inch.
 - 3. Slope:
 - a. Roof Field: 1/2 inch per foot unless otherwise indicated on Drawings.
 - b. Saddles and Crickets: 1/2 inch per foot unless otherwise indicated on Drawings.

2.6 INSULATION ACCESSORIES

- A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.
- B. Fasteners: Factory-coated steel fasteners with 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.
- C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
 - 1. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.
- D. Cover Board: ASTM C1177/C1177M, glass-mat, water-resistant gypsum board.
 - 1. Manufacturers: Subject to compliance with requirements, provide the following product or equivalent:
 - a. Dens Deck by Georgia-Pacific Gypsum LLC.
 - 2. Thickness: ½ inch.
 - 3. Surface Finish: Factory primed

2.7 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads, approximately 3/16 inch thick and acceptable to roofing system manufacturer.
 - 1. Size: Approximately 36 by 60 inches.
 - 2. Provide walk pads at the entire perimeter of each roof top unit, service side of small units and fans, at all ladders and at the opening side of all roof hatches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 05-3100 "Steel Decking."
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Install sound-absorbing insulation strips according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOFING, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions and FM Global Property Loss Prevention Data Sheet 1-29.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

3.4 INSTALLATION OF SUBSTRATE BOARD

- A. Install the substrate board only over the main roof at pools indicated on drawings/details.
- B. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than **24 inches** in adjacent rows.
 - 1. At steel roof decks, install substrate board at right angle to flutes of deck.
 - a. Locate end joints over crests of steel roof deck.
 - 2. Tightly butt substrate boards together.
 - 3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 4. Fasten substrate board to top flanges of steel deck according to recommendations in FM Global Property Loss Prevention Data Sheet 1-29.
 - 5. Fasten substrate board to top flanges of steel deck to resist uplift pressure at corners, perimeter, and field of roof according to roofing system manufacturers' written instructions.
 - 6. Should any fasteners penetrate the exposed underside of the acoustical deck, repairs are to be made at the contractor's expense.

3.5 INSTALLATION OF INSULATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

- B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.
- C. Installation directly to Metal Decking where indicated on drawings:
 - 1. Install minimum of 2 layers of insulation to be loose laid.
 - 2. Install base layer of insulation with joints staggered not less than 24 inches in adjacent rows and with long joints continuous at right angle to flutes of decking.
 - a. Locate end joints over crests of decking.
 - b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay base layer of insulation units over substrate.
 - 3. Install upper layers of insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.
 - a. Staggered end joints within each layer not less than 24 inches in adjacent rows.
 - b. Install with long joints continuous and with end joints staggered not less than 12 inches in adjacent rows.
 - c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - d. Make joints between adjacent insulation boards not more than 1/4 inch in width.
 - e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24 inches.
 - 1) Trim insulation so that water flow is unrestricted.
 - f. Fill gaps exceeding 1/4 inch with insulation.
 - g. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
 - h. Loosely lay each layer of insulation units over substrate.

3.6 INSTALLATION OF COVER BOARDS

- A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction.
 - 1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
 - 2. At internal roof drains, conform to slope of drain sump.

- a. Trim cover board so that water flow is unrestricted.
3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to insulation in areas indicated on drawings using adhesive according to manufacturer's written instructions, as follows:
 - a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
5. Mechanically fasten cover board through insulation down to acoustical deck in areas indicated on drawings using manufacturer's approved fasteners and plates.
 - a. Follow manufacturer's written fastening patterns to achieve specified wind uplift resistance.
 - b. Fasten cover board to top flutes of acoustical steel deck. Should any fasteners penetrate the exposed underside of the acoustical deck, repairs are required to be made at the contractor's expense.

3.7 INSTALLATION OF ADHERED ROOF MEMBRANE

- A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.
- B. Unroll roof membrane and allow to relax before installing.
- C. Start installation of roofing in presence of roofing system manufacturer's technical personnel and third party testing and inspection agency.
- D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.
- F. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.
- G. Apply roof membrane with side laps shingled with slope of roof deck where possible.
- H. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, 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 roof membrane and sheet flashings.
 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.
- I. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.8 INSTALLATION OF BASE FLASHING

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to 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.

3.9 EDGE METAL INSTALLATION

- A. Refer to Section 07-7100 of specification.

3.10 INSTALLATION OF WALKWAYS

- A. Flexible Walkways:
 - 1. Install flexible walkways at the following locations:
 - a. Perimeter of each rooftop unit.
 - b. At the service side of other rooftop equipment such as exhaust fans
 - c. Top and bottom of each roof access ladder.
 - 2. Provide 6-inch clearance between adjoining pads.
 - 3. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.11 FIELD QUALITY CONTROL

- A. When the work of this section is in progress, the third part technical inspector or manufacturer's trained representative shall provide the following:
 - 1. Keep the Architect informed as to the progress and quality of the work as observed.
 - 2. Provide job site inspections as per Section 1.02.F:
 - a. Two (2) full working days per every five (5) working days while roofing is in progress.
 - b. Provide a written report when onsite indicating the exact hours present.
 - 3. Report to the Architect, in writing, any failure or refusal of the Contractor to correct unacceptable practices called to the Contractor's attention.
 - 4. Confirm, after completion of the Project and based on manufacturer's observations and tests, that manufacturer has observed no applications procedures in conflict

with the specifications other than those that may have been previously reported and corrected.

- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.12 PROTECTING AND CLEANING

- A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.13 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS _____ of _____, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
 - 1. Owner
 - 2. Address:
 - 3. Building Name/Type:
 - 4. Address:
 - 5. Area of Work:
 - 6. Acceptance Date: _____.
 - 7. Warranty Period: _____.
 - 8. Expiration Date: _____.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period Roofing Installer will, at Roofing Installer's

own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
 - e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract

Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this _____ day of _____, _____.

1. Authorized Signature: _____.
2. Name: _____.
3. Title: _____.

END OF SECTION 07-5423

SECTION 07 71 00 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Copings.
2. Roof-edge specialties.
3. Roof-edge drainage systems.
4. Reglets and counterflashings.
5. Underlayment.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing embedded reglets.
2. Section 042000 "Unit Masonry" for installing embedded reglets and for masonry through-wall flashing with receiver for counterflashing.
3. Section 055000 "Metal Fabrications" for downspout guards and downspout boots.
4. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
5. Section <Insert Section number> "<Insert Section title>" for air barrier and compatibility with and transitions to underlayment for roof specialties.
6. Section <Insert Section number> "<Insert Section title>" for roof-edge drainage-system components provided by metal-roof-panel manufacturer.
7. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated, sheet metal flashing and trim.
8. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
9. Section 077200 "Roof Accessories" for manufactured roof curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
10. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.
11. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
12. Section 099113 "Exterior Painting" for field painting of roof specialties.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1. Meet with Owner, Architect, Owner's insurer if applicable, roofing-system testing and inspecting agency representative, roofing Installer, roofing-system manufacturer's representative, Installer, structural-support Installer, and installers whose work interfaces with or affects roof specialties, including installers of roofing materials and accessories.

2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of roof specialty.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: For roof specialties.
 1. Plans, expansion-joint locations, keyed details, and attachments to other work. Distinguish between factory pre manufactured- and field-assembled installation.
 2. Details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
 3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
 4. Details of termination points and assemblies, including fixed points.
 5. Details of special conditions.
- C. Samples: For each type of roof specialty and for each color and texture specified.
- D. Samples for Initial Selection: For each type of roof specialty indicated with factory-applied color finishes.
- E. Samples for Verification:
 1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
 2. Include [copings][roof-edge specialties][roof-edge drainage systems][reglets and counterflashings] made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of roof specialty [copings][and][roof-edge flashings] that is [ANSI/SPRI/FM 4435/ES-1 tested][and][FM Approvals approved].
- B. Product Test Reports: For [copings][and][roof-edge flashings], for tests performed by a qualified testing agency.
- C. Research Reports: For [copings][and][roof-edge flashings], from [an agency acceptable to authorities having jurisdiction] showing compliance with ANSI/SPRI/FM 4435/ES-1.
- D. Qualification Statements: For manufacturer.
- E. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For roof specialties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer offering products that are [FM Approvals listed for specified class][and][ANSI/SPRI/FM 4435/ES-1 tested to specified design pressure].

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Build mockup of typical roof edge as indicated on Drawings.
 - 2. Build mockup of typical roof edge as part of "Integrated Exterior Mockup" specified in [Section 014000 "Quality Requirements."]<Insert Section number and title.>
 - 3. Build mockup of typical roof edge
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.9 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.10 COORDINATION

- A. Coordinate roof specialties with roofing system, exterior wall system, air barrier, flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, weathertight, secure, and noncorrosive installation.

1. Performance Coordination: Coordinate with the Work of roofing and exterior wall Sections to ensure that roof specialties provided under the Work of this Section meet or exceed specified roofing and exterior wall design performance requirements.
- B. Confirm and coordinate compatibility of materials and comply with warranty requirements of roofing system manufacturer.
- C. Coordinate roof specialties layout and seams with sizes and locations of joints and seams in adjacent materials.

1.11 WARRANTY

- A. Roofing-System Warranty: Roof specialties are included in warranty provisions of TPO roofing
- B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finishes or replace roof specialties 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 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - 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 SOURCE LIMITATIONS

- A. Obtain roof specialties from single manufacturer providing roofing-system warranty specified in Section <Insert Section number> "<Insert Section title>."

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.
- C. FM Approvals' Listing: Manufacture and install [copings][roof-edge specialties] that are

listed in FM Approvals' "Approval Guide" and approved for windstorm classification, [Class 1-60][Class 1-75][Class 1-90][Class 1-105][Class 1-120]<Insert class>. Identify materials with FM Approvals' markings.

- D. SPRI Wind Design Standard: Manufacture and install [copings][roof-edge specialties] tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressures:
 - 1. Design Pressure: [As indicated on Drawings]
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent 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 thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature change>.

2.3 COPINGS

- A. Metal Copings: Manufactured coping system consisting of metal coping cap in section lengths not exceeding [12 ft.]<Insert dimension>, concealed anchorage; with corner units, end cap units, and concealed splice plates with finish matching coping caps.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Architectural Products Company]
 - b. [ATAS International, Inc.]
 - c. [Berridge Manufacturing Company]
 - d. [Castle Metal Products]
 - e. [Cheney Flashing Company]
 - f. [Drexel Metals Corp.]
 - g. [Englert, Inc.]
 - h. [EXCEPTIONAL Metals]
 - i. [FlashCo Manufacturing Inc.]
 - j. [Hickman; an MTL Company]
 - k. [Merchant & Evans Inc.]
 - l. [Metal-Era, Inc.]
 - m. [OMG Roofing Products; a Division of OMG, Inc.]
 - n. [PAC-CLAD; Petersen; a Carlisle company]
 - o. [SAF (Southern Aluminum Finishing Company, Inc.)]
 - p. [Sentrigard; NB Handy Company]
 - q. <Insert manufacturer's name>
 - 2. Metallic-Coated Steel Coping Caps: Zinc-coated (galvanized) or aluminum-zinc

alloy-coated steel sheet, nominal [0.028-inch thickness][0.034-inch thickness][thickness as required to meet performance requirements]<Insert thickness>.

- a. Surface: [Smooth, flat][Embossed] finish.
 - b. Finish: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer]<Insert finish>.
 - c. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
3. Formed Aluminum Coping Caps: Aluminum sheet, [0.040 inch thick][0.050 inch thick][0.063 inch thick][thickness as required to meet performance requirements]<Insert thickness>.
 - a. Surface: [Smooth, flat][Embossed] finish.
 - b. Finish: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer][Clear anodic][Color anodic]<Insert finish>.
 - c. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
4. Extruded-Aluminum Coping Caps: Extruded aluminum, [0.080 inch thick][0.125 inch thick][thickness as required to meet performance requirements]<Insert thickness>.
 - a. Finish: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer][Clear anodic][Color anodic]<Insert finish>.
 - b. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
5. Formed Stainless Steel Coping Caps: Stainless steel sheet, nominal [0.0313-inch thickness][thickness as required to meet performance requirements]<Insert thickness>.
 - a. Finish: [ASTM A480/A480M No. 2B (bright, cold rolled)][ASTM A480/A480M No. 3 (coarse, polished directional satin)][ASTM A480/A480M No. 4 (bright, polished directional satin)]<Insert finish>.
6. Formed Copper Coping Caps: Copper sheet, [16 oz./sq. ft.][20 oz./sq. ft.][24 oz./sq. ft.][Thickness as required to meet performance requirements].
 - a. Copper Finish: [Non-patinated, mill][Pre-patinated dark brown][Pre-patinated verdigris]<Insert finish>.
7. Corners: Factory mitered and [soldered][continuously welded][mechanically clinched and sealed watertight].

8. Special Fabrications: [Radiused sections][Arched sections][Bullnose-face leg][Two-way sloped coping cap]<Insert description>.
9. Coping-Cap Attachment Method: [Snap-on][or][face leg hooked to continuous cleat with back leg fastener exposed], fabricated from coping-cap material.
 - a. Snap-on Coping Anchor Plates: Concealed, galvanized-steel sheet, 12 inches wide, with integral cleats.
 - b. Face-Leg Cleats: Concealed, continuous [galvanized-steel sheet][stainless steel].

2.4 ROOF-EDGE SPECIALTIES

- A. Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding [12 ft.]<Insert dimension> and a continuous metal receiver with integral drip-edge cleat to engage fascia cover[and secure single-ply roof membrane]. Provide matching corner units.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ATAS International, Inc.]
 - b. [Berridge Manufacturing Company]
 - c. [Drexel Metals Corp.]
 - d. [Englert, Inc.]
 - e. [EXCEPTIONAL Metals]
 - f. [Fabral; a brand of Flack Global Metals]
 - g. [FlashCo Manufacturing Inc.]
 - h. [Hickman; an MTL Company]
 - i. [Metal-Era, Inc.]
 - j. [OMG Roofing Products; a Division of OMG, Inc.]
 - k. [PAC-CLAD; Petersen; a Carlisle company]
 - l. <Insert manufacturer's name>
 2. Metallic-Coated Steel Fascia Covers: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, nominal [0.028-inch thickness][0.034-inch thickness][thickness as required to meet performance requirements]<Insert thickness>.
 - a. Surface: [Smooth, flat][Embossed] finish.
 - b. Finish: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer]<Insert finish>.
 - c. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 3. Formed Aluminum Fascia Covers: Aluminum sheet, [0.040 inch thick][0.050 inch thick][0.063 inch thick][thickness as required to meet performance requirements]<Insert thickness>.

- a. Surface: [Smooth, flat][Embossed] finish.
 - b. Finish: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer][Clear anodic][Color anodic]<Insert finish>.
 - c. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- 4. Corners: Factory mitered and [soldered][continuously welded][mechanically clinched and sealed watertight].
 - 5. Splice Plates: [Concealed][Exposed], of same material, finish, and shape as fascia cover.
 - 6. Receiver: [Galvanized-steel sheet, nominal 0.040-inch thickness][Aluminum sheet, 0.050 inch thick][Extruded aluminum, 0.080 inch thick][Manufacturer's standard material and thickness].
 - 7. Special Fabrications: [Radiused sections][Arched sections][Bullnose fascia cover][Cornice fascia cover][Cove fascia cover]<Insert description>.
 - 8. Fascia Accessories: [Fascia extenders with continuous hold-down cleats][Wall cap][Soffit trim][Overflow scuppers][Overflow scuppers with perforated screens][Spillout scuppers][Downspout scuppers with integral conductor head and downspout adapters][Downspout scuppers with integral conductor head and downspout adapters and perforated screens]<Insert description>.

2.5 REGLETS AND COUNTERFLASHINGS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [ATAS International, Inc.]
 - 2. [Berridge Manufacturing Company]
 - 3. [Castle Metal Products]
 - 4. [Cheney Flashing Company]
 - 5. [Drexel Metals Corp.]
 - 6. [EXCEPTIONAL Metals]
 - 7. [Fry Reglet Corporation]
 - 8. [Heckmann Building Products, Inc.]
 - 9. [Hickman; an MTL Company]
 - 10. [Keystone Flashing Company, Inc]
 - 11. [Metal-Era, Inc.]
 - 12. [OMG Roofing Products; a Division of OMG, Inc.]
 - 13. <Insert manufacturer's name>
- B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:
 - 1. Metallic-Coated Steel Sheet: Nominal [0.022-inch][0.028-inch]<Insert dimension> thickness.
 - 2. Formed Aluminum Sheet: [0.024 inch][0.050 inch]<Insert dimension> thick.

3. Formed Stainless Steel Sheet: [0.0188 inch][0.0250 inch]<Insert dimension> thick.
 4. Formed Copper Sheet: [16 oz./sq. ft.][20 oz./sq. ft.][24 oz./sq. ft.][Thickness as required to meet performance requirements].
 5. Corners: Factory mitered and [soldered][continuously welded][mechanically clinched and sealed watertight].
 6. Surface-Mounted Type: Provide reglets with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
 7. Stucco Type, Embedded: Provide reglets with upturned fastening flange and extension leg of length to match thickness of applied finish materials.
 8. Concrete Type, Embedded: 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.
 9. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
 10. Multiuse Type, Embedded: For multiuse embedment in [cast-in-place concrete][masonry mortar joints].
- C. Counterflashings: Manufactured units of heights to overlap top edges of base flashings by 4 inches and in lengths not exceeding [12 ft.]<Insert dimension> designed to snap into [reglets][or][through-wall-flashing receiver] and compress against base flashings with joints lapped, from the following exposed metal:
1. Metallic-Coated Steel Sheet: Nominal [0.022-inch][0.028-inch]<Insert dimension> thickness.
 2. Formed Aluminum Sheet: [0.024 inch][0.032 inch]<Insert dimension> thick.
 3. Formed Stainless Steel Sheet: [0.0188 inch][0.0250 inch]<Insert dimension> thick.
 4. Formed Copper Sheet: [16 oz./sq. ft.][20 oz./sq. ft.][24 oz./sq. ft.][Thickness as required to meet performance requirements].
- D. Accessories:
1. Flexible-Flashing Retainer: Provide resilient plastic or rubber accessory to secure flexible flashing in reglet where clearance does not permit use of standard metal counterflashing or where reglet is provided separate from metal counterflashing.
 2. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing lower edge.
- E. Finishes:
1. Metallic-Coated Steel: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer]<Insert finish>.
 - a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 2. Aluminum: [Two-coat fluoropolymer][Three-coat fluoropolymer][Two-coat mica fluoropolymer][Three-coat metallic fluoropolymer][Clear anodic][Color

anodic]<Insert finish>.

- a. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
3. Stainless Steel: [ASTM A480/A480M No. 2B (bright, cold rolled, unpolished)][ASTM A480/A480M No. 3 (coarse, polished directional satin)][ASTM A480/A480M No. 4 (bright, polished directional satin)]<Insert finish>.
4. Copper: [Non-patinated, mill][Pre-patinated verdigris]<Insert finish>.

2.6 SHEET METAL MATERIALS

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality.[Mill phosphatized for field painting where indicated].
 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 3. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 1. Mill Finish: As manufactured.
 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 3. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
 4. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 5. Exposed Coil-Coated Finish: Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

- a. Two-Coat Fluoropolymer Finish: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight in color coat.
- 6. Concealed Finish: Pretreat with 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.
- C. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise, mill finished.
- D. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304.
- E. Copper Sheet: ASTM B370, cold-rolled copper sheet, H00 or H01 temper.

2.7 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Roof specialty manufacturer's recommended fasteners, designed to meet performance requirements, 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. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.
 - 4. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
 - 5. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
- C. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- D. Elastomeric Sealant: ASTM C920, elastomeric [polyurethane][silicone] polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.
- E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.
- F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

- G. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
- H. Solder for Copper: ASTM B32, [lead-free solder][Grade Sn50, 50 percent tin and 50 percent lead]<Insert solder grade>.

2.8 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "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: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining 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, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.
- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install roof specialties in accordance with manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, underlayments, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- 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's written installation instructions.

1. Coat concealed side of [uncoated aluminum][and][stainless steel] roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of [12 ft.]<Insert dimension> with no joints within [18 inches]<Insert dimension> of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate [wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws][substrate not less than recommended in writing by fastener manufacturer to achieve maximum pull-out resistance]<Insert size requirement>.

E. Seal concealed joints with butyl sealant as required by roof specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

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; however, reduce pre-tinning where pre-tinned surface would show in completed Work. Tin edges of uncoated copper sheets using solder for copper. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

3.3 INSTALLATION OF COPINGS

A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor copings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

1. Interlock face and back leg drip edges of snap-on coping cap into cleated anchor plates anchored to substrate at [30-inch centers][40-inch centers][manufacturer's required spacing that meets performance requirements]<Insert spacing>.
2. Interlock face-leg drip edge into continuous cleat anchored to substrate at [24-inch centers][16-inch centers][manufacturer's required spacing that meets performance requirements]<Insert spacing>. Anchor back leg of coping with

screw fasteners and elastomeric washers at [24-inch centers][16-inch centers][manufacturer's required spacing that meets performance requirements]<Insert spacing>.

3.4 INSTALLATION OF ROOF-EDGE SPECIALTIES

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

- A. Coordinate installation of reglets and counterflashings with installation of base flashings.
- B. Embedded Reglets: See [Section 033000 "Cast-in-Place Concrete"] [and] [Section 042000 "Unit Masonry"] for installation of reglets.
- C. Surface-Mounted Reglets: Install reglets to receive flashings where flashing without embedded reglets is indicated on Drawings. Install at height so that inserted counterflashings overlap 4 inches over top edge of base flashings.
- D. Counterflashings: Insert counterflashings into reglets or other indicated receivers; ensure that counterflashings overlap 4 inches over top edge of base flashings. Lap counterflashing joints a minimum of 4 inches and bed with butyl sealant. Fit counterflashings tightly to base flashings.

3.6 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099113 "Exterior Painting."
- C. Clean and neutralize flux materials. Clean off excess solder and sealants.
- D. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- E. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 71 00

SECTION 07 71 29 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 SUMMARY

A. Related Requirements:

1. Section 061000 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
2. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
3. Section 077200 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Flanged bellows-type roof expansion joints.
2. Extruded bellows roof expansion joints.
3. Aluminum roof expansion joints.
4. Preformed foam sealant-type roof expansion joints.

B. Shop Drawings: For roof expansion joints.

1. Include plans, elevations, sections, and attachment details.
2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

- C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

- B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

- C. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of roofing membrane.

1.6 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: [Two] years from date of Substantial Completion.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints 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 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
 - 1. Temperature Change: [120 deg F, ambient; 180 deg F]<Insert temperature change>, material surfaces.
- B. Fire-Resistance Rating: Comply with ASTM E1966 or UL 2079; testing by a qualified testing agency to resist the spread of fire and to accommodate building thermal[and seismic] movements without impairing its ability to resist the passage of fire and hot gases. Identify products with appropriate markings of applicable testing agency.
 - 1. Rating: Not less than [1-hour][2-hour][fire-resistance rating of the roof assembly]<Insert rating>.
 - 2. Indicate design designations from UL's "Fire Resistance Directory" or from the

listings of another qualified testing agency.

2.2 MISCELLANEOUS MATERIALS

- A. Adhesives: As recommended by roof-expansion-joint manufacturer.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 - 1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.
- C. Mineral-Fiber Blanket: ASTM C665.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joint openings, substrates, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
 - 2. Install roof expansion joints true to line and elevation; and without warping, jogs in alignment, buckling, or tool marks.
 - 3. Provide for linear thermal expansion of roof-expansion-joint materials.
 - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 - 5. Provide uniform, neat seams.
 - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
- B. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.
- C. Transitions to Other Expansion-Control Joint Assemblies: Coordinate installation of roof expansion joints with other exterior expansion-control joint assemblies specified in

Section 079513.16 "Exterior Expansion Joint Cover Assemblies" to result in watertight performance.[Install factory-fabricated units at transitions between roof expansion joints and exterior expansion-control joint systems.]

- D. Splices: Splice roof expansion joints to provide continuous, uninterrupted, and waterproof joints.
 - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- E. Fire Barrier: Install fire barrier as required by manufacturer to provide continuous, uninterrupted fire resistance throughout length of roof expansion joint, including transitions and end joints.
- F. 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.

END OF SECTION 07 71 29

SECTION 07 22 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Roof curbs.
2. Equipment supports.
3. Roof hatches.
4. Heat and smoke vents.
5. Gravity ventilators.
6. Pipe and duct supports.
7. Pipe portals.
8. Preformed flashing sleeves.
9. Roof walkways.
10. Underlayment.
11. Miscellaneous materials.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for metal vertical ladders, ships' ladders, and stairs for access to roof hatches.
2. Section 061000 "Rough Carpentry" for roof cants, nailers, blocking, and other pressure-preservative-treated wood.
3. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashing.
4. Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.
5. Section 079200 "Joint Sealants" for field-applied sealants between roof accessories and adjacent materials.
6. Section 099113 "Exterior Painting" for field painting of roof accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory.

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

B. Shop Drawings: For roof accessories.

1. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, and special conditions. Distinguish between plant- and field-assembled work.

C. Delegated Design Submittals: For [roof curbs][equipment supports][and][walkways]

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 mounting, securing, and flashing of roof-mounted items to roof structure. Indicate coordinating requirements with roof membrane system.
 2. Wind-Restraint Details: Detail fabrication and attachment of wind restraints. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.
- D. Samples: For each type of roof accessory and for each color and texture specified.
- E. Samples for Initial Selection: For each type of roof accessory indicated with factory-applied color finishes.
- F. Samples for Verification: Include Samples of each type of roof accessory to verify finish and color selection, in manufacturer's standard sizes.
- G. Sustainable Design Submittals:

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:
1. Size and location of roof accessories specified in this Section.
 2. Method of attaching roof accessories to roof or building structure.
 3. Other roof-mounted items, including mechanical and electrical equipment, ductwork, piping, and conduit.
 4. Required clearances.
- B. Qualification Statements: For [manufacturer][fabricator][Installer][specialist][testing agency][manufacturer's technical representative][factory-authorized service representative]<Insert entity or specialist>.
- C. Delegated Design Engineer Qualifications: For [Insert product].

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roof accessories.

1.5 QUALITY ASSURANCE

- A. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in [state]<Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof accessories in contact with other materials that might cause staining, denting, or other surface damage. Store roof accessories in accordance with manufacturer's instructions.
- B. Store materials off ground in dry location and in accordance with manufacturer's instructions in well-ventilated area.
- C. Store and protect roof accessories from nicks, scratches, and blemishes.

1.7 FIELD CONDITIONS

- A. Field Measurements: Verify profiles and tolerances of roof-accessory substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.8 COORDINATION

- A. Coordinate layout and installation of roof accessories with [roofing membrane and base flashing and]interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories to withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design [roof curbs][and][equipment supports] to comply with wind performance requirements, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Wind-Restraint Performance: [As indicated on Drawings]<Insert requirements>.

2.2 ROOF CURBS

- A. Internally reinforced roof-curb units capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings, bearing continuously on roof structure, and capable of meeting performance requirements; with welded or mechanically fastened and sealed corner joints,[straight sides,][integral metal cant,][stepped integral metal cant to raise the thickness of roof insulation,] and integrally formed deck-mounting flange at perimeter bottom.

- B. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [AES Industries, Inc]
 2. [AES Sunoptics; Acuity Brands International, Inc.]
 3. [Air Balance; MESTEK, Inc.]
 4. [ATAS International, Inc.]
 5. [Conn-Fab Sales, Inc]
 6. [Curbs Plus, Inc]
 7. [Custom Solution Roof and Metal Products, a division of Colony Heating]
 8. [Greenheck Fan Corporation]
 9. [KCC Manufacturing]
 10. [Lloyd Industries, Inc.]
 11. [LMCurbs]
 12. [Louvers & Dampers, Inc.; Mestek, Inc.]
 13. [Metallic Products Corporation]
 14. [Pate Company (The)]
 15. [Plenums of Florida Incorporated]
 16. [RCS Fabrications Inc.]
 17. [Roof Products and Systems (RPS); Duravent Group]
 18. [Roof Products, Inc.]
 19. [Thybar Corporation]
 20. [Vent Products Co., Inc]
 21. <Insert manufacturer's name>
- C. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- D. Supported Load Capacity: [Coordinate load capacity with information on Shop Drawings of equipment to be supported]<Insert load requirements>.
- E. Steel: [Zinc-coated (galvanized)][Aluminum-zinc alloy-coated] steel sheet, [0.052 inch][0.064 inch][0.079 inch]<Insert dimension> thick.
1. Finish: [Mill phosphatized][Factory prime coating][Powder coat]<Insert finish>.
 2. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- F. Aluminum: [0.090 inch][0.125 inch]<Insert dimension> thick sheet.
1. Finish: [Mill][Factory prime coating][Clear anodic][Color anodic][Powder coat]<Insert finish>.
 2. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Light bronze][Medium bronze][Dark bronze]<Insert color>.
- G. Stainless Steel: [0.0781 inch]<Insert dimension> thick sheet.
1. Finish: [Manufacturer's standard]<Insert finish>.

H. Construction:

1. Curb Profile: [Manufacturer's standard][Profile as indicated on Drawings] compatible with roofing system.
2. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
3. Fabricate curbs to minimum height of [12 inches]<Insert dimension> above roofing surface unless otherwise indicated.
4. Top Surface: Level top of curb, with roof slope accommodated [by sloping deck-mounting flange][or][by use of leveler frame].
5. Sloping Roofs: Where roof slope exceeds 1/4 inch per 12 inches, fabricate curb with perimeter curb height tapered to accommodate roof slope so that top surface of perimeter curb is level. Equip unit with water diverter or cricket on side that obstructs water flow.
6. Insulation: Factory insulated with [1-1/2-inch-]<Insert dimension> thick glass-fiber board insulation.
7. Liner: Same material as curb, of manufacturer's standard thickness and finish.
8. Nailer: Factory-installed wood nailer [along top flange of curb][under top flange on side of curb], continuous around curb perimeter.
9. Wind-Restraint Straps and Base Flange Attachment: Provide wind-restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb, of size and spacing required to comply with wind-uplift requirements.
10. Platform Cap: Where portion of roof curb is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
11. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as curb.
12. Security Grille: [Provide for all units][Provide where indicated].
13. Damper Tray: Provide damper tray or shelf with opening [3 inches]<Insert dimension>[less than interior curb dimensions indicated][of size indicated].

2.3 EQUIPMENT SUPPORTS

- A. [Internally reinforced perimeter][Rail-type] metal equipment supports capable of supporting superimposed live and dead loads between structural supports, including equipment loads and other construction indicated on Drawings, spanning between structural supports; capable of meeting performance requirements; with welded[or mechanically fastened and sealed] corner joints,[integral metal cant,][stepped integral metal cant to raise the thickness of roof insulation,] and integrally formed structure-mounting flange at bottom.
- B. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [AES Industries, Inc]
 2. [Air Balance; MESTEK, Inc.]
 3. [Conn-Fab Sales, Inc]

4. [Curbs Plus, Inc]
 5. [Greenheck Fan Corporation]
 6. [JL Industries; Activar Construction Products Group, Inc.]
 7. [KCC Manufacturing]
 8. [Lloyd Industries, Inc.]
 9. [LMCurbs]
 10. [Louvers & Dampers, Inc.; Mestek, Inc.]
 11. [Pate Company (The)]
 12. [Plenums of Florida Incorporated]
 13. [Portals Plus; Duravent Group]
 14. [RCS Fabrications Inc.]
 15. [Roof Products and Systems (RPS); Duravent Group]
 16. [Roof Products, Inc.]
 17. [Thybar Corporation]
 18. [Vent Products Co., Inc]
 19. <Insert manufacturer's name>
- C. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
- D. Supported Load Capacity: [Coordinate load capacity with information on Shop Drawings of equipment to be supported]<Insert load requirements>.
- E. Steel: [Zinc-coated (galvanized)][Aluminum-zinc alloy-coated] steel sheet, [0.052 inch][0.064 inch][0.079 inch]<Insert dimension> thick.
1. Finish: [Mill phosphatized][Factory prime coating][Powder coat]<Insert finish>.
 2. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- F. Aluminum: [0.090 inch][0.125 inch]<Insert dimension> thick sheet.
1. Finish: [Mill][Factory prime coating][Clear anodic][Color anodic][Powder coat]<Insert finish>.
 2. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Light bronze][Medium bronze][Dark bronze]<Insert color>.
- G. Stainless Steel: [0.0781 inch]<Insert dimension> thick sheet.
1. Finish: [Manufacturer's standard]<Insert finish>.
- H. Construction:
1. Curb Profile: [Manufacturer's standard][Profile as indicated on Drawings] compatible with roofing system.
 2. Insulation: Factory insulated with [1-1/2-inch]<Insert dimension> thick glass-fiber board insulation.
 3. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
 4. Nailer: Factory-installed continuous wood nailers [3-1/2 inches][5-

- 1/2 inches]<Insert dimension> wide [on top flange of equipment supports][under top flange on side of curb], continuous around support perimeter.
5. Wind-Restraint Straps and Base Flange Attachment: Provide wind-restraint straps, welded strap connectors, and base flange attachment to roof structure at perimeter of curb of size and spacing required to comply with wind-uplift requirements.
 6. Platform Cap: Where portion of equipment support is not covered by equipment, provide weathertight platform cap formed from 3/4-inch- thick plywood covered with metal sheet of same type, thickness, and finish as required for curb.
 7. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
 8. On ribbed or fluted metal roofs, form deck-mounting flange at perimeter bottom to conform to roof profile.
 9. Fabricate equipment supports to minimum height of [12 inches]<Insert dimension> above roofing surface unless otherwise indicated.
 10. Sloping Roofs: Where roof slope exceeds 1/4 inch per 12 inches, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.
 11. Security Grille: [Provide for all units][Provide where indicated on Drawings].

2.4 ROOF HATCHES

- A. Metal roof-hatch units with lids and insulated [single][double]-walled curbs, welded or mechanically fastened and sealed corner joints, continuous lid-to-curb counterflashing and weathertight perimeter gasketing,[straight sides,][integral metal cant,][stepped integral metal cant to raise the thickness of roof insulation,] and integrally formed deck-mounting flange at perimeter bottom.
- B. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [ACUDOR Products, Inc]
 2. [AES Industries, Inc]
 3. [Architectural Specialties, Inc.]
 4. [Babcock-Davis]
 5. [BILCO Company (The)]
 6. [Dur-Red Products]
 7. [JL Industries; Activar Construction Products Group, Inc.]
 8. [KCC Manufacturing]
 9. [Kingspan Light + Air LLC]
 10. [Lexcor; a division of Luxsoco corp.]
 11. [Metallic Products Corporation]
 12. [Milcor by Duravent; Duravent Group.]
 13. [Nystrom, Inc.]
 14. [O'Keeffe's Inc.]
 15. [Pate Company (The)]
 16. [Precision Ladders, LLC]

17. [Williams Brothers Corporation of America]
18. <Insert manufacturer's name>

C. Type and Size:

1. Single-leaf lid, [30 by 36 inches][36 by 36 inches][30 by 54 inches][30 by 96 inches]<Insert dimensions>.
2. Double-leaf lid, [72 by 96 inches]<Insert dimensions>.

D. Loads: Minimum [40 lbf/sq. ft.]<Insert value> external live load and [20 lbf/sq. ft.]<Insert value> internal uplift load.

1. Dome Glazing: Minimum [40 lbf/sq. ft.]<Insert value> external live load and [20 lbf/sq. ft.]<Insert value> internal uplift load.

E. Hatch Material, Steel: [Zinc-coated (galvanized)][Aluminum-zinc alloy-coated] steel sheet.

1. Thickness: [Manufacturer's standard thickness for hatch size indicated][0.079 inch]<Insert dimension>.
2. Finish: [Mill phosphatized][Factory prime coating][Powder coat]<Insert finish>.
3. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

F. Hatch Material, Aluminum:

1. Thickness: [Manufacturer's standard thickness for hatch size indicated][0.079 inch]<Insert dimension>.
2. Finish: [Mill][Factory prime coating][Clear anodic][Color anodic][Powder coat]<Insert finish>.
3. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range][Light bronze][Medium bronze][Dark bronze]<Insert color>.

G. Hatch Material, Stainless Steel:

1. Thickness: [Manufacturer's standard thickness for hatch size indicated][0.0781 inch]<Insert dimension>.
2. Finish: [Manufacturer's standard]<Insert finish>.

H. Construction:

1. Insulation: [1-inch- thick, cellulosic-fiber board][1-inch- thick, glass-fiber board][2-inch-thick, polyisocyanurate board].
 - a. R-Value: [2.78][4.3][12.0]<Insert R-value> in accordance with ASTM C1363.
2. Nailer: Factory-installed wood nailer continuous around hatch perimeter.
3. Hatch Lid: [Opaque][Glazed], insulated, and double walled, with manufacturer's

- standard metal liner of same material and finish as outer metal lid.
4. Curb Liner: Manufacturer's standard, of same material and finish as metal curb.
 5. On ribbed or fluted metal roofs, form flange at perimeter bottom to conform to roof profile.
 6. Fabricate curbs to minimum height of [12 inches]<Insert dimension> above roofing surface unless otherwise indicated.
 7. Sloping Roofs: Where slope or roof deck exceeds 1/4 inch per 12 inches, fabricate curb with perimeter curb height that is [constant][tapered to accommodate roof slope so that top surfaces of perimeter curb are level]. Equip hatch with water diverter or cricket on side that obstructs water flow.
- I. Hatch-Lid Glazing: [Single][Double][acrylic][polycarbonate] glazing of thickness capable of resisting indicated loads.
1. Single-Dome Color: [Colorless, transparent][White, translucent][Gray tinted, transparent][Bronze tinted, transparent]<Insert requirement>.
 2. Outer Double-Dome Color: [Colorless, transparent][White, translucent][Gray tinted, transparent][Bronze tinted, transparent]<Insert requirement>.
 3. Inner Double-Dome Color: [Colorless, transparent][White, translucent][Gray tinted, transparent][Bronze tinted, transparent]<Insert requirement>.
- J. Hardware: Spring operators, hold-open arm, [galvanized][stainless] steel spring latch with turn handles, [galvanized][stainless] steel butt- or pintle-type hinge system, and padlock hasps inside and outside.
1. Provide two-point latch on lids larger than 84 inches.
 2. Provide remote-control operation.
- K. Safety Railing System: Roof-hatch manufacturer's standard system, including rails, clamps, fasteners, safety barrier at railing opening, and accessories required for a complete installation; attached to roof hatch and complying with 29 CFR 1910.23 requirements and authorities having jurisdiction.
1. Height: [42 inches]<Insert dimension> above finished roof deck.
 2. Posts and Rails: Galvanized-steel pipe, 1-1/4 inches in diameter or galvanized-steel tube, 1-5/8 inches in diameter.
 3. Flat Bar: Galvanized steel, 2 inches high by 3/8 inch thick.
 4. Maximum Opening Size: System constructed to prevent passage of a sphere 21 inches in diameter.
 5. Chain Passway Barrier: Galvanized proof coil chain with quick link on fixed end.
 6. Self-Latching Gate: Fabricated of same materials and rail spacing as safety railing system. Provide manufacturer's standard hinges and self-latching mechanism.
 7. Post and Rail Tops and Ends: Weather resistant, closed or plugged with prefabricated end fittings.
 8. Provide weep holes or another means to drain-entrapped water in hollow sections of handrail and railing members.
 9. Fabricate joints exposed to weather to be watertight.
 10. Fasteners: Manufacturer's standard, finished to match railing system.
 11. Finish: [Manufacturer's standard]<Insert finish>.

- a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
- L. Ladder-Assist Post: Roof-hatch manufacturer's standard device for attachment to roof-access ladder.
 - 1. Operation: Post locks in place on full extension; release mechanism returns post to closed position.
 - 2. Height: [42 inches]<Insert dimension> above finished roof deck.
 - 3. Material: [Steel tube][Stainless steel][Aluminum].
 - 4. Post: [1-5/8-inch-]<Insert dimension> diameter pipe.
 - 5. Finish: [Manufacturer's standard]<Insert finish>.
 - a. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

2.5 PREFORMED FLASHING SLEEVES

- A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, [12 inches]<Insert dimension> high, with removable metal hood and [slotted][perforated] metal collar.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Custom Solution Roof and Metal Products, a division of Colony Heating]
 - b. [Menzies Metal Products]
 - c. [Thaler Metal Industries Ltd.]
 - d. <Insert manufacturer's name>
 - 2. Metal: Aluminum sheet, [0.063 inch]<Insert thickness> thick.
 - 3. Diameter: [As indicated on Drawings][3 inches][4 inches][5 inches][6 inches][7 inches][8 inches][9 inches][10 inches]<Insert dimension>.
 - 4. Finish: [Manufacturer's standard]<Insert finish>.
- B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Custom Solution Roof and Metal Products, a division of Colony Heating]
 - b. [Menzies Metal Products]
 - c. [Milcor by Duravent; Duravent Group.]

- d. [Thaler Metal Industries Ltd.]
 - e. <Insert manufacturer's name>
2. Metal: [Aluminum sheet, 0.063 inch thick]<Insert material and thickness>.
 3. Height: [7 inches][13 inches][19 inches]<Insert dimension>.
 4. Diameter: [As indicated on Drawings][2 inches][3 inches][4 inches][5 inches][6 inches]<Insert dimension>.
 5. Finish: [Manufacturer's standard]<Insert finish>.

2.6 ROOF WALKWAYS

- A. Roof Walkway: Metal planking formed from multiple C-shaped channels with upper surface punched in serrated diamond or rectangular shapes to produce raised slip-resistant surface and drainage holes. Provide support framing, brackets, connectors, nosings, and other accessories and components needed for complete installation.
1. Include step units or stairs of similar construction for changes in elevation. Comply with ASCE/SEI 7, 29 CFR 1910.23, and requirements of authorities having jurisdiction.
 2. Equip walkways with safety railings where required.
 3. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Atkore Unistrut]
 - b. [Cooper B-line; brand of Eaton, Electrical Sector]
 - c. [Kee Safety, Inc.]
 - d. [MIRO Industries Inc.]
 - e. [PHP Systems/Design]
 - f. <Insert manufacturer's name>
 4. Plank Width: [4-3/4 inches][7 inches][9-1/2 inches][11-3/4 inches][18-3/4 inches][24 inches][As indicated].
 5. Walkway Width: [As indicated]<Insert dimension>.
 6. Channel Depth: [1-1/2 inches][2 inches][2-1/2 inches][3 inches][As indicated].
 7. Metal Material: [0.079-inch- thick zinc-coated (galvanized) steel sheet][0.108-inch- thick zinc-coated (galvanized) steel sheet][0.0625-inch- thick stainless steel sheet][0.0781-inch- thick stainless steel sheet][0.080-inch- thick aluminum sheet][0.100-inch- thick aluminum sheet]<Insert material and thickness>, perforated, with serrated slip-resistant walking surface.
 8. Support Stands: Manufacturer's standard, with protective pads compatible with roofing material.
 9. Support Pads: Continuous wood isolation pads, pressure-preservative treated as specified in Section 061000 "Rough Carpentry"; attach roof-walkway supports to pads so that supports are separated from roof membrane surface and walkway support loads are distributed evenly.
 10. Wind Restraint: Provide wind-restraint attachment to roof structure of size and spacing required to comply with wind-uplift requirements.
 11. Finish: [Manufacturer's standard]<Insert finish>.

2.7 METAL MATERIALS

- A. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheer complying with minimum ASTM A653/A653M, G90 coating designation or aluminum-zinc alloy-coated steel sheet complying with minimum ASTM A792/A792M, Class AZ50 coating designation; structural quality.
 - 1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
 - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 - 3. Powder Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
 - 4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil.
- B. Aluminum Sheet: ASTM B209/B209M, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.
 - 1. Mill Finish: As manufactured.
 - 2. Factory Prime Coating: Where field painting is indicated, apply pretreatment and white or light-colored, factory-applied, baked-on epoxy primer coat, with a minimum dry film thickness of 0.2 mil.
 - 3. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
 - 4. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 - 5. Powder Coat Finish: AAMA 2603. After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.
 - 6. Concealed Finish: Pretreat with 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.
- C. Aluminum Extrusions and Tubes: ASTM B221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.
- D. Stainless Steel Sheet and Shapes: ASTM A240/A240M or ASTM A666, Type 304.
- E. Steel Shapes: ASTM A36/A36M, hot-dip galvanized in accordance with ASTM A123/A123M unless otherwise indicated.
- F. Steel Tube: ASTM A500/A500M, round tube.
- G. Galvanized-Steel Tube: ASTM A500/A500M, round tube, hot-dip galvanized in accordance with ASTM A123/A123M.
- H. Steel Pipe: ASTM A53/A53M, galvanized.

2.8 MISCELLANEOUS MATERIALS

- A. Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Acrylic Glazing: ASTM D4802, thermoformable, monolithic sheet, manufacturer's standard, Type UVA (formulated with UV absorber), Finish 1 (smooth or polished).
- C. Polycarbonate Glazing: Thermoformable, monolithic polycarbonate sheets manufactured by extrusion process, burglar-resistance rated in accordance with UL 972 with an average impact strength of [12 to 16 ft. lbf/in.]<Insert value> of width when tested in accordance with ASTM D256, Method A (Izod).
- D. Cellulosic-Fiber Board Insulation: ASTM C208, Type II, Grade 1, thickness as indicated.
- E. Glass-Fiber Board Insulation: ASTM C726, nominal density of 3 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F, thickness as indicated.
- F. Polyisocyanurate Board Insulation: ASTM C1289, thickness and thermal resistivity as indicated.
- G. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction,[containing no arsenic or chromium,] and complying with AWWA C2; not less than 1-1/2 inches thick.
- H. Security Grilles: [3/4-inch]<Insert dimension> diameter, ASTM A1011/A1011M steel bars spaced [6 inches]<Insert dimension> o.c. in one direction and [12 inches]<Insert dimension> o.c. in the other; factory finished as follows:
 - 1. Surface Preparation: Remove mill scale and rust, if any, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
 - 2. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment.
 - 3. Shop Primer: Manufacturer's or fabricator's standard, fast-curing, lead- and chromate-free, universal primer; selected for resistance to normal atmospheric corrosion, for compatibility with substrate and field-applied finish paint system indicated, and for capability to provide a sound foundation for field-applied topcoats under prolonged exposure.
- I. Fasteners: Roof accessory manufacturer's recommended fasteners, designed to comply with performance requirements, 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. Furnish the following unless otherwise indicated:
 - 1. Fasteners for Metallic-Coated Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
 - 2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
 - 3. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

- J. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.
- K. Elastomeric Sealant: ASTM C920, elastomeric [polyurethane][silicone] polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.
- L. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.
- M. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- N. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.9 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA AMP 500, "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: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining 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, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- C. Verify dimensions of roof openings for roof accessories.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install roof accessories in accordance with manufacturer's written instructions.
 - 1. Install roof accessories level; plumb; true to line and elevation; and without

- warping, jogs in alignment, 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 in writing by manufacturer's written installation instructions.
- 1. Coat concealed side of [uncoated aluminum][and][stainless steel] roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
 - 2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

3.3 INSTALLATION OF ROOF ACCESSORIES

- A. Roof Curb: Install each roof curb so top surface is level.
- B. Equipment Support: Install equipment supports so top surfaces are level with each other.
- C. Roof-Hatch:
- 1. Verify that roof hatch operates properly. Clean, lubricate, and adjust operating mechanism and hardware.
 - 2. Attach safety railing system to roof-hatch curb.
 - 3. Attach ladder-assist post in accordance with manufacturer's written instructions.
- D. Heat and Smoke Vent:
- 1. Install heat and smoke vent so top perimeter surfaces are level.
 - 2. Install and test heat and smoke vents and their components for proper operation in accordance with NFPA 204.
- E. Gravity Ventilator: Verify that gravity ventilators operate properly and have unrestricted airflow. Clean, lubricate, and adjust operating mechanisms.
- F. Pipe and Duct Support: Comply with MSS SP-58. Install supports and attachments as required to properly support piping. Arrange for grouping of parallel runs of horizontal piping, and support together.
- 1. Pipes of Various Sizes: Space supports for smallest pipe size or install intermediate supports for smaller-diameter pipes as specified for individual pipe hangers.

- G. Preformed Flashing-Sleeve and Flashing-Pipe Portal: Secure flashing sleeve to roof membrane in accordance with flashing-sleeve manufacturer's written instructions; flash sleeve flange to surrounding roof membrane in accordance with roof membrane manufacturer's instructions.
- H. Security Grilles: Weld bar intersections and[, using tamper-resistant bolts, attach the] ends of bars to structural frame or primary curb walls.
- I. Roof Walkway:
 - 1. Verify that locations of access and servicing points for roof-mounted equipment are served by locations of roof walkways.
 - 2. Remove ballast from top surface of low-slope roofing at locations of contact with roof-walkway supports.
 - 3. Install roof-walkway support pads prior to placement of roof-walkway support stands onto low-slope roofing.
 - 4. Redistribute removed ballast after installation of support pads.
- J. Seal joints with [elastomeric][or][butyl] sealant as required by roof accessory manufacturer.

3.4 CLEANING AND PROTECTION

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing in accordance with ASTM A780/A780M.
- B. Touch up factory-primed surfaces with compatible primer ready for field painting in accordance with Section 099113 "Exterior Painting."
- C. On completion of installation, clean exposed surfaces in according with manufacturer's written instructions. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as roof accessories are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof accessories in a clean condition during construction.
- E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 07 72 00

SECTION 07 22 73 - VEGETATED ROOF SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Tray-type vegetated roof assembly.

B. Related Requirements:

1. Section TPO for roofing membrane, roof thermal insulation, aggregate or roof-paver ballast, and roofing system warranty.
2. Section 323300 "Site Furnishings" for exterior unit planters.

1.2 DEFINITIONS

- A. Captured Water: Water that is retained in the drainage layer of a vegetated roof assembly after new water additions have ceased and that cannot escape the roof except through evaporation or plant transpiration.
- B. Finish Elevation: Elevation of finished growing-media surface of planting area.
- C. Growing Medium: Manufactured, lightweight soil mixture that promotes good growing conditions for specific varieties of plants.
- D. Planting Area: Areas to be planted.
- E. Plant; Plants; Plant Material: Vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each vegetated roof assembly.
 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 2. Include material descriptions for each growing medium.
- B. Shop Drawings: For each vegetated roof assembly.

1. Include plans, sections, slopes, and drain locations.
 2. Indicate dimensions, weights, and loads.
 3. Detail field assembly of components, depth of growing media, and attachments to other work.
 4. Indicate [walkway pavers][geofoam fill][locations of irrigation][coordination with lighting][and][accessories].
- C. Samples for Verification: For each of the following components of vegetated roof assembly:
1. Preplanted Vegetative Mat: 12 by 12 inches.
 2. Growing Media: [1-pint][1-quart]<Insert quantity> volume of each growing medium, in sealed plastic bags labeled with content and source. Each Sample to be typical of the lots of growing media to be furnished. Provide an accurate representation of texture and composition.
 3. Moisture-Retention Mat: 12 by 12 inches.
 4. Drainage Panels: 12 by 12 inches.
 5. Root Barrier: 12 by 12 inches.
 6. Walkway paver, [full size,][manufacturer's standard size,]<Insert requirement> in each color and texture required; include installation accessories to illustrate assembly.
 7. Geofoam Fill: 12 by 12 inches.
 8. Separation Geotextile: 12 by 12 inches.
 9. Access Boxes: One in each size and color required.
 10. Soil Retainer: Manufacturer's standard size to verify configuration and color selected.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of manufactured product.
1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory, in accordance with methods established by the Association of Official Analytical Chemists, where applicable.
- C. Product Test Reports: For complete analysis of each growing medium, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency.
- D. Field quality-control reports.
- E. Sample Warranty: For special warranties.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For vegetated roof assembly and plants, including a recommended

maintenance plan with procedures for inspection and care during a calendar year. Submit before start of required warranty and maintenance periods.

- B. Continuing Maintenance Proposal: From vegetated roof assembly Installer[approved by roofing-membrane manufacturer] to Owner, in the form of a standard 2 year maintenance agreement, starting on date initial maintenance service is concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified vegetated roof assembly Installer[, approved, authorized, or licensed by roofing-membrane manufacturer,] whose work has resulted in successful establishment of vegetated roofs.
 - 1. Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when vegetated roof assembly work is in progress.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials on or near structures, utilities, walkways and pavements, or existing roof areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of debris-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with product certificates.
- C. Handle and store materials, and place equipment in a manner to avoid overloading roof structure or damaging roofing membrane.

1.9 FIELD CONDITIONS

- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

1.10 WARRANTY

- A. Special Warranty for Vegetated Roof Assembly: Installer agrees to repair or replace components of vegetated roof assembly that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, ponding water or prolonged wetness of growing medium caused as a result of failure of the assembly to properly drain.
 2. Warranty Period: [Five] years from date of [Substantial Completion][Planting Completion]
- B. Special Warranty for Plant Growth: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.
1. Foliage Cover: Planted materials to grow to achieve and maintain at least [80] percent foliage cover over planting area commencing 18 months after planting, through the duration of this warranty.
 2. Failures include, but are not limited to, death and unsatisfactory growth except for defects resulting from abuse, lack of adequate maintenance, neglect by Owner, or incidents that are beyond Contractor's control.
 3. Warranty Period: From date of [Substantial Completion] as follows:
 - a. Ground Covers, Perennials, Vines, and Ornamental Grasses: Two years.
 4. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 5. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain [vegetated roof assembly components][growing medium][walkway pavers and setting bed or supports][geofoam fill and separation geotextile][and][accessories] from single source from single manufacturer.

2.2 VEGETATED ROOF ASSEMBLIES

- A. Tray-Type Vegetated Roof Assembly: Modular assembly consisting of manufacturer's standard[, preplanted] trays for field assembly adjacent to and interlocking with each other over roofing system.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not

limited to, the following]:

- a. [Carlisle Syntec Systems]
 - b. [Columbia Green Technologies]
 - c. [Elevate; Amrize Building Envelope LLC]
 - d. [GreenGrid Roofs; Weston Solutions, Inc.]
 - e. [GreenTech, Inc.]
 - f. [Soprema, Inc.]
 - g. Live Roof - BoD**
- 2. Tray Depth, Nominal: per details
 - 3. Tray Size: per details
 - 4. Assembly Weight: Maximum [15 lb/sq. ft.][28 lb/sq. ft.]<Insert requirement>, including growing medium and plants[except for large perennials and trees] and saturated with captured water, but not including weight of roofing system.
 - 5. Plantings: Sedum as selected by Architect from manufacturer's standard varieties AND MIX PROVIDED BY THINK GREEN ON LANDSCAPE DRAWINGS

2.3 VEGETATED ROOF ASSEMBLY COMPONENTS

- A. Moisture-Retention Mat: Assembly manufacturer's standard water-retaining fabric manufactured from [recycled] synthetic fibers.
- B. Drainage Panels: Assembly manufacturer's standard drainage board formed from [geotextile-faced, molded-plastic sheet with a geotextile face and "cups" of the molded sheet facing upward like small reservoirs to retain water while allowing excess water to drain away below the board][or][geotextile-faced, entangled plastic-filament core].
- C. Root Barrier: Vegetated roof assembly manufacturer's standard plastic sheet manufactured from [recycled] polyethylene or polypropylene plastic; formulated to resist root growth and bacteria.
- D. Erosion-Control Fabric: [Vegetated roof assembly manufacturer's standard erosion-control fabric]<Insert description>.
- E. Anti-Slip Devices: [Vegetated roof assembly manufacturer's standard anti-slip devices]<Insert description>.
- F. Recycled Content: [Moisture-retention mat][drainage panels][trays][and][root barrier]<Insert component> material shall have postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert value> percent.

2.4 MANUFACTURED GROWING MEDIA

- A. Growing Medium: Vegetated roof assembly manufacturer's lightweight, manufactured soil mixture designed for [plants indicated on Drawings][Planting Area 1][Planting Area 2][and][Tree Type 1]<Insert planting area or plant type>.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by

the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Midwest Trading Horticultural Supplies, Inc.; a Midwest-Orum Company]
 - b. [Skyland USA]
 - c. [Stancills, Inc.]
 - d. [WeCare Denali, LLC]
 - e. [Wolf Mountain Products, LLC]
 - f. <Insert manufacturer's name>
2. General Condition at Time of Planting: Free of aggregates 1/2 inch or larger in any dimension; free of roots, plants, clods, pockets of sand, paint, building debris, oils, solvents, roofing materials, and other extraneous materials harmful to plant growth; free of weeds, disease-causing plant pathogens, and other undesirable organisms.
 3. Maximum Media Density: ASTM E2399, <Insert lb/cu. ft.> for basic growing-medium mixture.
 4. Maximum Media Water Retention: ASTM E2399, <Insert number> percent by volume for basic growing-medium mixture at maximum media density.
 5. Water Permeability: ASTM E2399, <Insert in/min.> for basic growing-medium mixture at maximum media density.
 6. Organic Material Content: ASTM F1647, Method A, organic material as measured using the loss-on-ignition procedure.
 - a. Minimum: [4][6][10]<Insert number> percent.
 - b. Maximum: [10][20][30]<Insert number> percent.
 7. Chemical Properties:
 - a. Growing-Medium pH (Reaction): [5.5][6.0][6.0 to 7.0][6.5][7.0]<Insert value or range>.
 - b. Cation Exchange Capacity: Minimum [20][50][75]<Insert value> meq/100 g of growing medium.
 - c. Nitrogen: Minimum [0.10][0.15]<Insert number> percent by weight.
 - d. Phosphorous: Minimum <Insert number> percent by weight.
 - e. Potassium: Minimum <Insert number> percent by weight.
 - f. <Insert property and value>.

2.5 SOIL AMENDMENTS

- A. Lime: ASTM C602, Class T or Class O agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through No. 6 sieve and a maximum of 10 percent passing through No. 40 sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 sieve.
- F. Superphosphate: Commercial, phosphate mixture, soluble; minimum 20 percent available phosphoric acid.
- G. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of <Insert number> percent fast- and slow-release nitrogen (50 percent derived from natural organic sources of urea formaldehyde), 4 percent phosphorous, and 2 percent potassium, by weight.
- H. Slow-Release Fertilizer: Granular or pelleted fertilizer, consisting of 20 percent nitrogen (50 percent of which is water insoluble), 10 percent phosphorus, and 10 percent potassium, by weight.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine each area to receive vegetated roof assembly for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Verify that roof insulation over roofing membrane is in place, secure, and flush along all seams.
 - 2. Verify that perimeter and other flashings are in place and secure along entire lengths where they will be covered by vegetated roof assembly.
- B. Inspect growing medium.
 - 1. Verify that no foreign or deleterious material or liquid, such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in growing medium within a planting area.
 - 2. If growing medium is contaminated by foreign or deleterious material or liquid, remove growing medium and contamination and replace with new growing medium.

3.2 INSTALLATION, GENERAL

- A. Protection Course: Cover roofing system with protection board with butted and fully taped joints before roofing system is subject to vegetated roof assembly installation work.
- B. Install vegetated roof assembly in accordance with manufacturer's written instructions.
- C. Sloped Roofs: Install [erosion-control fabric][and][anti-slip devices] for slopes steeper than [1/2 inch per 12 inches (1:24)]<Insert slope> in accordance with manufacturer's

written instructions.

- D. Small Plant Stabilization: Install erosion-control fabric over planting area to secure small plants in accordance with manufacturer's written instructions.
- E. Geofoam Fill: Install geofoam-fill blocks in as few layers as possible with abutting edges and ends and with the long dimension of each block placed at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers.
 - 1. Install geofoam connectors at each layer, without damaging roofing system, to resist horizontal displacement of geofoam and in accordance with geofoam-fill manufacturer's written instructions.
 - 2. Cover geofoam fill with separation geotextile before placing overlying growing medium.

3.3 PLANTING

- A. Perform planting in accordance with vegetated roof assembly manufacturer's written instructions.
- B. Do not place growing medium or plants during frozen, wet, or muddy conditions.
- C. Suspend spreading, grading, and planting operations during periods of excessive moisture until the moisture content in growing medium reaches acceptable levels to attain the required results.
- D. Uniformly moisten an excessively dry growing medium that is too dusty or unworkable.
- E. Preplanted Vegetative Mat: Install in full contact with growing medium and secure in position.
- F. Site Planting: Plant vegetated roofs in accordance with requirements specified in [Section 329200 "Turf and Grasses"] and [Section 329300 "Plants"] except as otherwise indicated on Drawings and required by vegetated roof assembly manufacturer's written instructions. Perform digging carefully to prevent damaging roofing system below the vegetated roof assembly.
- G. Seeding Grasses: Sow seed at a total rate of [2 lb/1000 sq. ft.][3 to 4 lb/1000 sq. ft.][5 to 8 lb/1000 sq. ft.]<Insert values>.
- H. Meadow Grasses and Wildflowers: Sow seed at a total rate of [4 oz./1000 sq. ft.][5 oz./1000 sq. ft.][6 oz./1000 sq. ft.]<Insert values>.
- I. Sprigging Grasses: Plant individual sprigs with roots and portions of stem in moistened growing medium, [6 inches][12 inches]<Insert dimension> apart in rows [10 inches][12 inches]<Insert dimension> apart, and fill furrows without covering growing tips. Lightly roll and firm growing medium around sprigs after planting.
- J. Plugging: Plant plugs in holes or furrows, spaced [12 inches]<Insert dimension> apart in [both directions][triangular pattern].

- K. Individual Plant Planting: Set out and space plants other than grasses and wildflowers [9 inches apart][12 inches apart][18 inches apart][24 inches apart][as indicated on Drawings]<Insert dimension> in even rows with triangular spacing.

1. Dig holes large enough to allow spreading of roots.
2. Free up or remove girdling roots.
3. Work growing medium around roots to eliminate air pockets.
4. Water thoroughly after planting, taking care not to cover plant crowns with wet growing medium.
5. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.4 INSTALLATION OF SOIL RETAINER

- A. Install soil retainer where indicated in accordance with manufacturer's written instructions.[Secure with adhesive.]

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage][Engage] a qualified testing agency to perform tests.
- B. Perform the following tests:
1. Flood Testing: Flood test each deck area for leaks, in accordance with procedures in ASTM D5957, after completing and protecting roofing membrane but before placing overlaying construction. Install temporary containment assemblies, plug or dam drains, and flood with potable water.
 - a. Flood to an average depth of 2-1/2 inches, with a minimum depth of 1 inch and a maximum depth of 4 inches. Maintain 2 inches of clearance from top of sheet flashings.
 - b. Flood each area for [24][48][72] hours.
 2. Electronic Leak-Detection Testing:
 - a. Testing agency will test [each deck area][each deck area indicated for testing on Drawings]<Insert area to be tested> for leaks using an electronic leak-detection method that locates discontinuities in the roofing membrane.
 - b. Testing agency will perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
 - c. Testing agency will create a conductive electronic field over the area of roofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the roofing.
 - d. Testing agency will provide survey report indicating locations of discontinuities if any.
 3. Proceed with installation of vegetated roof assembly only after unsatisfactory conditions have been corrected.

- C. Manufacturer's Field Service: Engage roofing-membrane manufacturer's authorized service representative to provide[full-time] inspection of vegetated roof assembly installation and prepare inspection reports.
- D. Correct deficiencies in work that do not comply with requirements.
- E. Prepare test and inspection reports.

3.6 PROTECTION

- A. Protect vegetated roof assemblies from damage, including growing-medium contamination, due to operations of other contractors and trades. Repair or replace damaged vegetated roof assemblies.

3.7 MAINTENANCE SERVICE

- A. Maintenance Service: Provide maintenance by skilled employees of vegetated roof assembly Installer[approved by roofing-membrane manufacturer]. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than the specified maintenance period.
 - 1. Assembly and Plant Maintenance: During maintenance period, maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing devices, resetting plants to proper elevations or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
 - a. Replace growing medium that becomes displaced or eroded because of settling or other processes.
 - b. Apply treatments as required to keep plant materials, planted areas, and growing medium free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.
 - c. Use only products and methods acceptable to roofing-membrane manufacturer.
 - 2. Maintenance Period: 24 months from date of [Substantial Completion]

END OF SECTION 07 72 73

SECTION 07810 - APPLIED FIREPROOFING

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 sprayed fire-resistive materials.
- B. Related Requirements:
 - 1. Section 05 12 00 "Structural Steel Framing".
 - 2. Section 05 31 00 "Steel Decking"

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at the Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, densities, thicknesses, bond strengths, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified 4 inches square in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.

- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.
- D. Preconstruction Test Reports: For fireproofing.
- E. Field quality-control reports.

1.6 QUALITY CONTROL

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.7 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing of fireproofing.
- B. Preconstruction Adhesion and Compatibility Testing: Test for compliance with requirements for specified performance and test methods.
 - 1. Bond Strength: Test for cohesive and adhesive strength according to ASTM E 736. Provide bond strength indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 2. Density: Test for density according to ASTM E 605. Provide density indicated in referenced fire-resistance design, but not less than minimum specified in Part 2.
 - 3. Verify that manufacturer, through its own laboratory testing or field experience, attests that primers or coatings are compatible with fireproofing.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, obtain applied-fireproofing manufacturer's written instructions for corrective measures including the use of specially formulated bonding agents or primers.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 44 deg F 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 fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.
- C. The project has existing spray applied fire-proofing, it is imperative that we maintain the 1 hour rating on steel and decks and that any damage to existing spray applied fireproofing

that occurred during demo is properly addressed to meet adherence and application requirements.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 or UL 263; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Applied sealer and topcoat products shall comply with VOC content limits of authorities having jurisdiction and the following VOC limits:
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
- E. Low-Emitting Materials: Fireproofing used within the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- F. Asbestos: Provide products containing no detectable asbestos.

2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design, and mixed with water at Project site to form a slurry or mortar before conveyance and application or conveyed in a dry state and mixed with atomized water at place of application.
 - 1. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Bond Strength: Minimum 430-lbf/sq. ft. cohesive and adhesive strength based on field testing according to ASTM E 736.
 - 3. Density: Not less than density specified in the approved fire-resistance design, according to ASTM E 605.

4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch.
5. Combustion Characteristics: ASTM E 136.
6. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 10 or less.
 - b. Smoke-Developed Index: 10 or less.
7. Compressive Strength: Minimum 100 lbf/sq. in. according to ASTM E 761.
8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
11. Air Erosion: Maximum weight loss of 0.025 g/sq. ft. in 24 hours according to ASTM E 859.
12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in no growth on specimens per ASTM G 21.

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing 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: Primers approved by fireproofing manufacturer and complying with one or both of the following requirements:
 1. Primer and substrate are identical to those tested in required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 2. Primer's bond strength in required fire-resistance design complies with specified bond strength for fireproofing and with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction, based on a series of bond tests according to ASTM E 736.
- C. Bonding Agent: Product approved by fireproofing manufacturer and complying with requirements in UL's "Fire Resistance Directory" or in the listings of another qualified testing agency acceptable to authorities having jurisdiction.
- D. Metal Lath: Expanded metal lath fabricated from material of weight, configuration, and finish required, according to fire-resistance designs indicated and fireproofing manufacturer's written instructions. Include clips, lathing accessories, corner beads, and other anchorage devices required to attach lath to substrates and to receive fireproofing.

- E. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- F. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.
- G. Sealer: Transparent-drying, water-dispersible, tinted protective coating recommended in writing by fireproofing manufacturer for each fire-resistance design.
- H. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.
 - 1. Cement-Based Topcoat: Factory-mixed, cementitious hard-coat formulation for trowel or spray application over SFRM.
 - 2. Water-Based Permeable Topcoat: Factory-mixed formulation for brush, roller, or spray application over applied SFRM. Provide application at a rate of 60 sq. ft./gal..

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Verify that concrete work on steel deck is complete before beginning fireproofing work.
- C. Verify that roof construction, installation of rooftop HVAC equipment, and other related work are complete before beginning fireproofing work.
- D. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- E. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- F. 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 fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Metal Decks:
 - 1. Do not apply fireproofing to underside of metal deck substrates until concrete topping, if any, is completed.
 - 2. Do not apply fireproofing to underside of metal roof deck until roofing is completed; prohibit roof traffic during application and drying of fireproofing.
- E. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

- F. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- G. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- H. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- I. For applications over encapsulant materials, including lockdown (post-removal) encapsulants, apply fireproofing that differs in color from that of encapsulant over which it is applied.
- J. Where sealers are used, apply products that are tinted to differentiate them from fireproofing over which they are applied.
- K. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- L. Cure fireproofing according to fireproofing manufacturer's written instructions.
- M. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- N. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.
 - 4. Skip-Troweled Finish: Even leveled surface produced by troweling spray-applied finish to smooth out the texture and neaten edges.
 - 5. Skip-Troweled Finish with Corner Beads: Even, leveled surface produced by troweling spray-applied finish to smooth out the texture, eliminate surface markings, and square off edges.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, Subsection 1705.13, "Sprayed Fire-Resistant Materials."
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.

- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07810

SECTION 07 81 23 - INTUMESCENT FIREPROOFING

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 mastic and intumescent fire-resistive coatings.
- B. Related Requirements:
 - 1. Section 078100 "Applied Fireproofing" for sprayed fire-resistive materials (SFRM).
 - 2. Section 099123 "Interior Painting"
 - 3. Section 099600 "High Performance Painting"

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer and testing agency.
- B. Product Certificates: For each type of fireproofing.

- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockup of each type of fireproofing and different substrate and each required finish as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F 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 fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E119 or UL 263; ULCDXA, UL CDYD, testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Extrapolation of member size or material thickness shown in individual designs has not been investigated by UL and would be considered to void the existing certified assembly.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Basis of Design: Sherwin Williams Firetex FX5120, or equal.

- B. Mastic and Intumescent Fire-Resistive Coating: Manufacturer's standard, factory-mixed formulation, and complying with indicated fire-resistance design.
1. Application: Designated for "interior conditioned space and interior general purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 2. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 3. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 0.
 - b. Smoke-Developed Index: 5 or less.
 4. Hardness: Not less than 70, Type D durometer, according to ASTM D2240.
 5. Adhesion: Not less than 540 psi, according to ASTM D4541.
 6. Finish: Smooth Finish, to match Level 5 gypsum Board, as specified in Section 09 2900 "Gypsum Board."
 7. Consider retaining "Color and Gloss" Subparagraph below if important to Project's appearance; consult manufacturer for recommendations.
 - a. Full system, 1 hour
 - 1) Primer: Pro Industrial ProCryl Universal Primer
 - 2) Intumescent Coat: Firetex FX5120 (1 hour rating)
 - 3) Topcoat: Pro Industrial Pre-Catalyzed Epoxy (Eggshell)

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing 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: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Topcoat: Suitable for application over intumescent fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.

2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
 - C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.

- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Alternate Application Method
 - 1. Apply fireproofing prior to the erection of steel at the project site. Fireproofing to be applied at the fabricator's facility or at the applicator's shop. Connections to be fireproofed at the project site.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- L. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Sherwin Williams USCA Water based Firetex Application.
 - 2. AWCI Technical Manual 12-B
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION

SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Penetration firestopping systems.
 - 1. Penetration firestopping systems in fire-resistance-rated walls.
 - 2. Penetration firestopping systems in horizontal assemblies.
 - 3. Penetration firestopping systems in smoke barriers.
 - 4. Exposed penetration firestopping systems.
- B. Related Requirements:
 - 1. Section 078443 "Joint Firestopping" for joints in or between fire-resistance-rated construction, at exterior curtain-wall/floor intersections, and in smoke barriers.
 - 2. Section 079200 "Joint Sealants" for non-fire-resistance-rated joint sealants.
 - 3. Section 079219 "Acoustical Joint Sealants" for sealing joints in sound-rated construction.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Product Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.
- C. Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) from firestopping manufacturer where no UL, FM Approvals, or other listed assembly is available for particular firestop configuration. Follow International Firestop Council (IFC) recommended guidelines for evaluating firestopping systems in EJs.
 - 1. Engineering Judgments: Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping system, submit illustration, with modifications marked, approved by penetration firestopping system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly developed in accordance with current International Firestop Council (IFC) recommended guidelines. Obtain approval of authorities having jurisdiction prior to submittal.
- D. Sustainable Design Submittals:

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Listed System Designs: For each penetration firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Entity that has been approved by FM Approvals in accordance with FM Approvals 4991 or been evaluated by UL Solutions and found to comply with "UL Solutions Qualified Firestop Contractor Program."
- B. Manufacturer Qualifications: Entity that has received UL Solutions' "Firestop Movement Certification," which demonstrates that manufacturer's firestopping products designated with M-Ratings are based on exposure to cyclic movement and UL 1479 fire test evaluation when tested in accordance with ASTM E3037.

1.7 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of each penetration firestopping system type required for Project, including supporting construction substrates, attachments, and accessories.
 - 2. Where one penetration firestopping system type may be used for different penetrating items or in different wall or floor constructions, install one assembly for each different combination.
 - 3. Obtain approval of mockups from authorities having jurisdiction before proceeding.
 - 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 FIELD CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping systems when ambient or substrate temperatures are outside limits permitted by penetration firestopping system manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

- B. Install and cure penetration firestopping system materials in accordance with manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.9 COORDINATION

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

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain penetration firestopping systems for each type of opening indicated from single manufacturer.

2.2 PENETRATION FIRESTOPPING SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [3M Building and Construction]
 - 2. [Balco; a CSW Industrials Company]
 - 3. [Everkem Diversified Products, Inc.]
 - 4. [FireShield; Fire Rated Solutions LLC]
 - 5. [Grabber Construction Products, Inc.]
 - 6. [Hilti, Inc.]
 - 7. [Holdrite; a division of Reliance Worldwide Corporation]
 - 8. [International Fireproof Technology Inc]
 - 9. [NUCO Inc]
 - 10. [Passive Fire Protection Partners]
 - 11. [Roxtec Inc.]
 - 12. [Specified Technologies Inc.]
 - 13. [STC Sound Control]
 - 14. [Tremco Incorporated]
 - 15. [Unique Fire Stop Products]
 - 16. <Insert manufacturer's name>
- B. Penetration firestopping systems must be compatible with one another, with the substrates forming openings, and with penetrating items if any.

1. Penetration firestopping systems must be installed with products bearing the classification marking of a qualified testing agency.
 - a. UL Solutions in its online directory "Product iQ."
 - b. Intertek Group in its "Directory of Building Products."
 - c. FM Approvals in its "Approval Guide."
 - d. <Insert name of qualified testing and inspecting agency>.
 2. Provide components for each penetration firestopping system that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water, or other forms of moisture characteristic during and after construction.
 3. Provide components for each penetration firestopping system that do not contain ethylene glycol.
 4. Provide components for each penetration firestopping system that are sufficiently flexible to accommodate movement, such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage.
 5. Provide components for each penetration firestopping system that are appropriately tested for the thickness and type of insulation utilized.
- C. Provide penetration firestopping systems that resist spread of fire, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated.
- D. Penetration Firestopping Systems in Fire-Resistance-Rated Walls: Systems with ratings determined in accordance with ASTM E814 or UL 1479.
1. F-Rating: Not less than the fire-resistance rating of the wall assembly penetrated.
 2. Membrane Penetrations: Install recessed fixtures such that the required fire resistance will not be reduced.
 3. M-Rating: Provide penetration firestopping systems meeting specified F-Rating after being tested in accordance with ASTM E3037.
- E. Penetration Firestopping Systems in Horizontal Assemblies: Systems with ratings determined in accordance with ASTM E814 or UL 1479.
1. F-Rating: At least one hour, but not less than the fire-resistance rating of the floor/ceiling assembly penetrated.
 2. T-Rating: At least one hour, but not less than the fire-resistance rating of the floor/ceiling assembly. The following horizontal penetrations do not require a T-rating:
 - a. Those within the cavity of a wall.
 - b. Floor, tub, or shower drains within a concealed space.
 - c. 4-inch or smaller metal conduit penetrating directly into metal-enclosed electrical switchgear.
 3. W-Rating: Provide penetration firestopping systems with a Class 1 W-rating in accordance with UL 1479.
 4. M-Rating: Provide penetration firestopping systems meeting specified [F-Rating,][T-Rating,][and][W-Rating] after being tested in accordance with ASTM

E3037.

- F. Penetration Firestopping Systems in Smoke Barriers: Systems with ratings determined in accordance with UL 1479.
1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening and no more than 50-cfm cumulative total for any 100 sq. ft. at both ambient and elevated temperatures.
 2. M-Rating: Provide penetration firestopping systems meeting specified L-Rating after being tested in accordance with ASTM E3037.
- G. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84 or UL 723.
1. Product Data: Verify architectural sealant has a VOC content of 250 g/L or less.
 2. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify formaldehyde emissions do not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Verify sealant complies with testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Verify the building concentration of formaldehyde does not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde does not exceed 9 mcg/cu. m.

2.3 ACCESSORIES

- A. Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping system manufacturer and approved by qualified testing and inspecting agency for conditions indicated, including but not limited to:
1. Permanent forming/damming/backing materials.
 2. Substrate primers.
 3. Collars.
 4. Steel sleeves.

2.4 FILL MATERIALS

- A. Cast-in-Place Firestopping Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer sleeve lined with an intumescent strip, a flange attached to one end of the sleeve for fastening to concrete formwork, and a

neoprene gasket.

- B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- C. Firestopping Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced intumescent elastomeric sheet bonded to galvanized-steel sheet.
- E. Intumescent Putties: Nonhardening, water-resistant, intumescent putties containing no solvents or inorganic fibers.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric strips for use around combustible penetrants.
- G. 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.
- H. Pillows/Bags: Compressible, removable, and reusable intumescent pillows encased in fire-retardant polyester or glass-fiber cloth. Where exposed, and when required by a listed system, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed or dislodged.
- I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants.
- K. Thermal and Endothermic Wraps: Flexible, insulating, and fire-resistant protective wraps tested and listed for up to 2-hour fire ratings in accordance with ASTM E814 or UL 1479; for protecting membrane penetrations of utility boxes, critical electrical circuits, communications lines, and fuel lines, and for thermal barrier and circuit integrity protection in accordance with ASTM E1725 or UL 1724.
- L. Fire-Rated Cable Sleeve Kits: Complete kits designed for new or existing cable penetrations through walls which accept standard accessories.
- M. Fire-Rated Cable Pathways: Single or gangable device modules composed of a steel raceway with integral intumescent material and requiring no additional action in the form of plugs, twisting closure, putty, pillows, sealant, or otherwise to achieve fire and air-leakage ratings.
 - 1. Fire-rated cable pathway devices are the preferred product for data, video, and communications cable penetrations. Install these devices in locations where frequent cable moves, add-ons, and changes will occur. Such devices must be:
 - a. Capable of retrofit around existing cables.

- b. Designed so that two or more devices can be ganged together.
 - c. Maintenance-free so no action is required to activate the smoke- and fire-sealing mechanism.
- 2. Where fire-rated cable pathway devices are not practical, openings within walls and floors designed to accommodate data, video, and communications cabling must be provided with re-enterable products specifically designed for retrofit, such as retrofit devices for cable bundles, firestopping putty, plugs, or pillows.
- N. Retrofit Device for Cable Bundles: Factory-made, intumescent, collar-like device for firestopping existing over-filled cable sleeves and capable of being installed around projecting sleeves and cable bundles.
- O. Wall-Opening Protective Materials: Intumescent, non-curing putty pads or self-adhesive inserts for protection of electrical switch and receptacle boxes.
- P. Fire-Rated HVAC Retaining Angles: Steel angle system with integral intumescent firestopping gasket for use around rectangular steel HVAC ducts without fire dampers.
- Q. Firestopping Plugs: Flexible, re-enterable, intumescent, foam-rubber plug for use in blank round openings and cable sleeves.
- R. Fire-Rated Cable Grommet: Molded two-piece grommet made of plenum-grade polymer and foam inner core for sealing small cable penetrations in gypsum walls up to 1/2 inch in diameter.
- S. Closet Flange Gasket: Molded, single-component, flexible, intumescent gasket for use beneath a water closet (toilet) flange in floor applications.

2.5 MIXING

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 INSTALLATION OF PENETRATION FIRESTOPPING SYSTEMS

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

3.4 IDENTIFICATION

- A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3 inches high and with minimum 0.375-inch strokes.
 - 1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15 ft. from end of wall and at intervals not exceeding 30 ft..

- B. Penetration Identification: Identify each penetration firestopping system with legible metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of penetration firestopping system edge so labels are visible to anyone seeking to remove penetrating items or firestopping systems. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
 - 1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
 - 2. Contractor's name, address, and phone number.
 - 3. Designation of applicable testing and inspecting agency.
 - 4. Date of installation.
 - 5. Manufacturer's name.
 - 6. Installer's name.

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified inspection agency to conduct and report on inspections in accordance with ASTM E2174.
- B. Where deficiencies are found or penetration firestopping system is damaged or removed because of testing, repair or replace penetration firestopping system to comply with requirements.
- C. Proceed with enclosing penetration firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

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

END OF SECTION 07 84 13

SECTION 07 84 43 - JOINT FIRESTOPPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Intumescent gypsum wall framing gaskets.
2. Joints in or between fire-resistance-rated construction.
3. Joints at exterior curtain-wall/floor intersections.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetrations in fire-resistance-rated walls, horizontal assemblies, and smoke barriers[and for wall identification].
2. Section 079513.13 "Interior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for interior floors, walls, and ceilings.
3. Section 079513.16 "Exterior Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies for exterior building walls, soffits, and parapets.
4. Section 079513.19 "Parking Deck Expansion Joint Cover Assemblies" for fire-resistive manufactured expansion-joint cover assemblies subject to vehicular traffic.
5. Section 092216 "Non-Structural Metal Framing" for firestop tracks for metal-framed partition heads.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

- B. Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) from firestop manufacturer where no UL, FM Approvals, or other listed assembly is available for particular firestop configuration. Follow International Firestop Council (IFC) recommended guidelines for evaluating firestop systems in EJs.

- C. Product Schedule: For each joint firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing agency.

1. Engineering Judgments: Where Project conditions require modification to a qualified testing agency's illustration for a particular joint firestopping system condition, submit illustration, with modifications marked, approved by joint firestopping system manufacturer's fire-protection engineer as an EJ or equivalent fire-resistance-rated assembly developed in accordance with current IFC guidelines.

D. Sustainable Design Submittals:

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Listed System Designs: For each joint firestopping system, for tests performed by a qualified testing agency.

1.5 CLOSEOUT SUBMITTALS

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

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Approvals in accordance with FM Approvals 4991 or been evaluated by UL and found to comply with UL's "UL Solutions Qualified Firestop Contractor Program."

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not install joint firestopping systems when ambient or substrate temperatures are outside limits permitted by joint firestopping system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Install and cure joint firestopping systems in accordance with manufacturer's written installation instructions using natural means of ventilation or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of joints to ensure that joint firestopping systems can be installed in accordance with specified firestopping system design.
- B. Coordinate sizing of joints to accommodate joint firestopping systems.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain joint firestop systems for each type of joint opening indicated from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics:
 - 1. A qualified testing agency, acceptable to authorities having jurisdiction, will perform joint firestopping system tests.
 - 2. Test in accordance with testing standards referenced in "Joint Firestopping Systems" Article. Provide rated systems complying with the following requirements:
 - a. Joint firestop systems installed with products bearing the classification marking of a qualified product certification agency in accordance with listed system designs published by a qualified testing agency.
 - 1) UL in its online directory "Product iQ."
 - 2) Intertek Group in its "Directory of Building Products."
 - 3) <Insert name of qualified testing agency>.
- B. Rain/Water Resistance: For perimeter fire-barrier system applications, where inclement weather or greater-than-transient water exposure is expected, use products that dry rapidly and cure in the presence of atmospheric moisture sufficient to pass ASTM D6904 early rain-resistance test (24-hour exposure).

2.3 JOINT FIRESTOPPING SYSTEM TYPES

- A. General: Systems that resist spread of fire, passage of smoke and other gases, and maintain original fire-resistance rating of assemblies in or between which joint firestopping systems are installed. Joint firestopping systems must accommodate building movements without impairing their ability to resist the passage of fire and hot gases.
 - 1. Joint firestopping systems that are compatible with one another, with the substrates forming openings, and with penetrating items, if any.
 - 2. Provide products that, upon curing, do not re-emulsify, dissolve, leach, break down, or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture.
 - 3. Provide firestop products that do not contain ethylene glycol.
- B. Intumescent Gypsum Wall Framing Gaskets: Applied to steel tracks, runners, and studs prior to framing installation. Provide products with fire, smoke, and acoustical ratings that allow movement of up to 100 percent compression and/or extension when

tested in accordance with UL 2079 or ASTM E1966; have an L Rating of less than 1 cfm/ft. when tested in accordance with UL 2079; and a minimum Sound Transmission Class (STC) rating of 56 when tested in accordance with ASTM E90 or ASTM C919.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [International Fireproof Technology Inc]
 - d. [Specified Technologies Inc.]
 - e. <Insert manufacturer's name>
- C. Joints in or between Fire-Resistance-Rated Construction: Provide joint firestopping systems with ratings determined in accordance with ASTM E1966 or UL 2079, with published L-Ratings for ambient and elevated temperatures as evidence of the ability of the fire-resistive joint system to restrict the movement of smoke.
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [3M Building and Construction]
 - b. [Balco; a CSW Industrials Company]
 - c. [CEMCO; California Expanded Metal Products Co.]
 - d. [ClarkDietrich]
 - e. [Everkem Diversified Products, Inc.]
 - f. [Grabber Construction Products, Inc.]
 - g. [Hilti, Inc.]
 - h. [International Fireproof Technology Inc]
 - i. [Marino\WARE]
 - j. [Nelson; Emerson Electric Co., Automation Solutions]
 - k. [NUCO Inc]
 - l. [Owens Corning]
 - m. [Passive Fire Protection Partners]
 - n. [RectorSeal Firestop; a CSW Industrials Company]
 - o. [ROCKWOOL]
 - p. [Specified Technologies Inc.]
 - q. [Tremco Incorporated]
 - r. [Willseal LLC, part of Tremco CPG]
 - s. <Insert manufacturer's name>
 2. Fire-Resistance Rating: Equal to or exceeding the fire-resistance rating of the wall, floor, or roof in or between which it is installed.
- D. Joints at Exterior Curtain-Wall/Floor Intersections: Provide joint firestopping systems with rating determined in accordance with ASTM E2307.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [3M Building and Construction]
 - b. [Balco; a CSW Industrials Company]
 - c. [Everkem Diversified Products, Inc.]
 - d. [Grabber Construction Products, Inc.]
 - e. [Hilti, Inc.]
 - f. [Johns Manville; a Berkshire Hathaway company]
 - g. [Nelson; Emerson Electric Co., Automation Solutions]
 - h. [NUCO Inc]
 - i. [Owens Corning]
 - j. [RectorSeal Firestop; a CSW Industrials Company]
 - k. [ROCKWOOL]
 - l. [Specified Technologies Inc.]
 - m. [Tremco Incorporated]
 - n. <Insert manufacturer's name>
 2. F-Rating: Equal to or exceeding the fire-resistance rating of the floor assembly.
- E. Exposed Joint Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined in accordance with ASTM E84.
1. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 5. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.

2.4 ACCESSORIES

- A. Provide components of joint firestopping systems, including primers and forming materials, that are needed to install elastomeric fill materials and to maintain ratings required. Use only components specified by joint firestopping system manufacturer and approved by the qualified testing agency for conditions 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 the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Before installing joint firestopping systems, clean joints in accordance with fire-resistive joint system manufacturer's written installation instructions and the following requirements:
 - 1. Remove foreign materials from substrate surfaces that could interfere with adhesion of elastomeric fill materials or compromise fire-resistive rating.
 - 2. Clean joint substrates to produce clean, sound surfaces capable of developing optimum bond with elastomeric fill materials. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Prime substrates in accordance with joint firestopping system manufacturer's written installation instructions, using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Apply a suitable bond breaker to prevent three-sided adhesion in applications where condition occurs.

3.3 INSTALLATION

- A. General: Install joint firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support elastomeric fill materials during their application and in position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing elastomeric fill materials and allowing them to fully cure, remove

combustible forming materials and other accessories not indicated as permanent components of fire-resistive joint system.

- C. Install elastomeric fill materials for joint firestopping systems by proven techniques to produce the following results:
 - 1. Apply elastomeric fill in voids and cavities formed by joints and forming materials as required to achieve fire-resistance ratings indicated.
 - 2. Apply elastomeric fill materials so they contact and adhere to substrates formed by joints.
 - 3. For elastomeric fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

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

3.5 FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections in accordance with ASTM E2393.
- B. Where deficiencies are found or joint firestopping systems are damaged or removed due to testing, repair or replace joint firestopping systems so they comply with requirements.
- C. Proceed with enclosing joint firestopping systems with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

- A. Clean off excess elastomeric fill materials adjacent to joints as the Work progresses by methods and with cleaning materials that are approved in writing by joint firestopping system manufacturers and that do not damage materials in which joints occur.
- B. Provide final protection and maintain conditions during and after installation that ensure joint firestopping 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 joint firestopping systems immediately and install new materials to produce joint firestopping systems complying with specified requirements.

3.7 JOINT FIRESTOPPING SYSTEM SCHEDULE

- A. Where UL-classified systems are indicated, they refer to system numbers in UL's online directory "Product iQ" under product [Category XHBN][or][Category XHDG].
- B. Where Intertek Group-listed systems are indicated, they refer to design numbers in Intertek Group's "Directory of Building Products" under product category [Expansion/Seismic Joints][or][Firestop Systems].
- C. Floor-to-Floor, Joint Firestopping Systems: .
 - 1. UL-Classified Systems: FF-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 - 2. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated]<Insert dimension>.
 - 4. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension][compression, extension, or horizontal shear].
 - 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 - 6. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
 - 7. W-Rating: No leakage of water at completion of water-leakage testing.
- D. Wall-to-Wall, Joint Firestopping Systems: .
 - 1. UL-Classified Systems: WW-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 - 2. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated]<Insert dimension>.
 - 4. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension].
 - 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 - 6. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
- E. Floor-to-Wall, Joint Firestopping Systems: .
 - 1. UL-Classified Systems: FW-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 - 2. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 - 3. Nominal Joint Width: [As indicated]<Insert dimension>.

4. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension][compression, extension, or horizontal shear].
 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 6. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
- F. Head-of-Wall, Fire-Resistive Joint Firestopping Systems: .
1. UL-Classified Systems: HW-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 2. Intertek Group-Listed Systems: <Insert design number>.
 3. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 4. Nominal Joint Width: [As indicated]<Insert dimension>.
 5. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension].
 6. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 7. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
- G. Bottom-of-Wall, Joint Firestopping Systems: .
1. UL-Classified Systems: BW-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 2. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 3. Nominal Joint Width: [As indicated]<Insert dimension>.
 4. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension].
 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 6. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
- H. Wall-to-Wall, Joint Firestopping Systems Intended for Use as Corner Guards: .
1. UL-Classified Systems: CG-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999][3000-3999][4000-4999].
 2. Assembly Rating: [One hour][Two hours]<Insert number of hours>.
 3. Nominal Joint Width: [As indicated]<Insert dimension>.
 4. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension].
 5. L-Rating at Ambient: Less than <Insert cfm/ft.>.
 6. L-Rating at 400 Deg F (204 Deg C): Less than <Insert cfm/ft.>.
- I. Perimeter Joint Firestopping Systems: .
1. UL-Classified Perimeter Fire-Containment Systems: CW-[D][S]-<Insert four-digit number>[0000-0999][1000-1999][2000-2999].
 2. Intertek Group-Listed, Perimeter Fire-Barrier Systems: <Insert design number>.
 3. Integrity Rating: [One hour][Two hours]<Insert number of hours>.
 4. Insulation Rating: [Zero hour][1/4 hour][3/4 hour][1 hour]<Insert number of hours>.
 5. Linear Opening Width: [2-1/2 inches][8 inches][As indicated]<Insert dimension>, maximum.
 6. Movement Capabilities: [Class I][Class II][Class III] - <Insert number> percent [compression or extension].

7. F-Rating: [One hour][Two hours]<Insert number of hours>.

END OF SECTION 07 84 43

SECTION 07 92 19 - ACOUSTICAL JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Acoustical joint sealants.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants" for elastomeric, latex, and butyl-rubber-based joint sealants for nonacoustical applications.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants, showing full range of available colors for each product exposed to view.
- C. Samples for Verification: For each type and color of acoustical joint sealant required.
 - 1. Size: 1/2-inch- wide sealant joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Acoustical Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.
- E. Sustainable Design Submittals:

1.3 INFORMATIONAL SUBMITTALS

- A. Test and Evaluation Reports:
 - 1. Product Test Reports: For each type of acoustical joint sealant, for tests performed by [qualified testing agency][manufacturer and witnessed by a qualified testing agency].
- B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.
2. Installer's special warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained between 40 and 95 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between [35 and 100 deg F][60 and 90 deg F].[Warm surfaces to be coated to 70 deg F to enhance drying.]

1.7 WARRANTY

A. Installer's Special Warranty: Installer agrees to repair or replace acoustical joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: [Two]<Insert number> years from date of Substantial Completion.

B. Manufacturer's Special Warranty: Manufacturer agrees to furnish acoustical joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACOUSTICAL JOINT SEALANTS

A. Acoustical joint-sealant products that effectively reduce airborne sound transmission through perimeter joints and openings in building construction, as demonstrated by testing representative assemblies in accordance with ASTM E90.

1. Sealant shall have a VOC content of 250 g/L or less.
2. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation

3. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.
 4. Sealant shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit, or 33 mcg/cu. m, and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- B. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex acoustical sealant complying with ASTM C834.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [DAP Products Inc.]
 - b. [Everkem Diversified Products, Inc.]
 - c. [Franklin International]
 - d. [Grabber Construction Products, Inc.]
 - e. [Hilti, Inc.]
 - f. [OSI Sealants; Henkel Corporation]
 - g. [Pecora Corporation]
 - h. [Specified Technologies Inc.]
 - i. <Insert manufacturer's name>
 2. Colors of Exposed Acoustical Joint Sealants: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range of colors]<Insert color>.
- C. Acoustical Sealant for Concealed Joints: Manufacturer's standard nonsag, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber acoustical sealant.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [OSI Sealants; Henkel Corporation]
 - b. [Pecora Corporation]
 - c. [Tremco Incorporated]
 - d. [USG Corporation]
 - e. <Insert manufacturer's name>

2.2 MISCELLANEOUS MATERIALS

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing acoustical joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where recommended by acoustical joint-sealant manufacturer. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF ACOUSTICAL JOINT SEALANTS

- A. Comply with acoustical joint-sealant manufacturer's written installation instructions unless more stringent requirements apply.
- B. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical joint sealant. Install acoustical joint sealants at both faces of partitions, at perimeters, and through penetrations. Comply with ASTM C919, ASTM C1193, and manufacturer's written instructions for closing off sound-flanking paths around or through assemblies,

including sealing partitions to underside of floor slabs above acoustical ceilings.

- C. Acoustical Ceiling Areas: Apply acoustical joint sealant at perimeter edge moldings of acoustical ceiling areas in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of acoustical joint sealants and of products in which joints occur.

3.5 PROTECTION

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

END OF SECTION 07 92 19

SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section references specification sections relating to commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding Doors.
 - 3. Other doors to the extent indicated.
- B. Commercial door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical and access control door hardware.
 - 3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
 - 4. Automatic operators.
 - 5. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section “All-Glass Entrances”.
 - 2. Division 08 Section “Door Hardware”.
 - 3. Division 26 Section “Electrical”.
 - 4. Division 28 Section “Access Control Hardware Devices”.
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. State Building Codes, Local Amendments.

- E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
 - 1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 - 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 - 3. 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 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.
 - g. Door and frame sizes and materials.
 - 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Keying Schedule: Prepared under the supervision of the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.
- D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum [3] years documented experience installing both standard and electrified builders 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.
- C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum [5] years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor in good standing by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- D. Source Limitations: Obtain each type and variety of Door Hardware specified in the Related Sections from a single source, qualified supplier unless otherwise indicated.
- E. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the applicable model building code.
- F. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- 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.

- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door and Frame Preparation: Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 MAINTENANCE SERVICE

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

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. Refer to "PART 3 – EXECUTION" for required specification sections.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

- A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
 2. The supplier is responsible for handing and sizing all products.
 3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
 4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.
- B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.
1. Section 08 41 26 – All Glass Entrances.
 2. Section 08 71 00 – Door Hardware.
- C. Manufacturer's Abbreviations:
1. MK - McKinney
 2. PE - Pemko
 3. GS - ASSA ABLOY Glass Solutions
 4. SU - Securitron
 5. RO - Rockwood
 6. RU - Corbin Russwin
 7. HS - HES
 8. RF - Rixson
 9. NO - Norton
 10. OT - Other

Hardware Sets

Set: 1.0

Doors: 100

2	Continuous Hinge	CFM-SLF-HD1 PT x Length Required		PE	087100	
2	Electric Power Transfer	EL-CEPT	630	SU	087100	✕
1	Mullion	CR900KM (Size as required)		RU	087100	
1	Rim Exit Device, Exit Only	PED5201 MELR EO M92	630	RU	087100	
1	Rim Exit Device, Nightlatch	PED5257 MELR K157ET M92 CTP	630	RU	087100	
2	Interchangeable Core	As Required	626	RU	087100	

1	Housing (Mullion)	As Required	626	RU	087100	
2	Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100	
2	Conc Overhead Stop	6-X36	630	RF	087100	
1	Surface Closer	PR7500 (Arm to suit)	600x689	NO	087100	
1	Automatic Opener	6300 Series	689	NO	087100	↗
2	Sweep	3452CNB x Length Required		PE	087100	
1	Threshold	273x224AFGT x Length Required		PE	087100	
2	ElectroLynx Harness - Frame	QC-C1500P		MK	087100	↗
2	ElectroLynx Harness - Door	QC-C x Length Required		MK	087100	↗
2	Door Switch	503/504/505 (As required)		NO	087100	↗
2	Position Switch	DPS-M-BK		SU	087100	↗
1	Power Supply	AQL4-R8E1 x Relays as Required		SU	087100	↗
1	Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes: Perimeter/meeting seals by frame/door supplier.

Coordinate door switches with Set 7.0 (Door C100).

Operational narrative: Doors normally closed and secure. Scheduled open for push/pull operation and hands free entry by door switches. Free egress - hands free by door switches. Door will latch and secure in event of power loss or fire alarm.

Set: 1.1

Doors: 004

1	Continuous Hinge	CFM-SLF-HD1 PT x Length Required		PE	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	↗
1	Rim Exit Device	PED5234-IN220 [A] 1029134PT BIPS CTP M35	630	RU	087100	↗
1	Interchangeable Core	As Required	626	RU	087100	
1	Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100	
1	Conc Overhead Stop	6-X36	630	RF	087100	
1	Surface Closer	PR7500 (Arm to suit)	600x689	NO	087100	
1	Sweep	3452CNB x Length Required		PE	087100	
1	Threshold	273x224AFGT x Length Required		PE	087100	
1	ElectroLynx Harness - Frame	QC-C1500P		MK	087100	↗
1	ElectroLynx Harness - Door	QC-C x Length Required		MK	087100	↗

1 Door Switch	503/504/505 (As required)	NO	087100	✂
1 Wiring Diagram	Elevation and Point to Point as Specified	OT		

Notes: Perimeter seals by frame/door supplier.

Operational narrative: Door normally closed and secure. Access by valid credential or key. Free egress always. Door remains latched and secure upon power loss or fire alarm activation. Access control system monitors door position (DPS) and verifies valid egress via REX. Doors may be scheduled open for push/pull operation.

Set: 2.0

Doors: 122, 139, 200B

1 Continuous Hinge	CFM-SLF-HD1 x Length Required		PE	087100
1 Rim Exit Device, Nightlatch	PED5257 M52 K157ET CTP	630	RU	087100
2 Interchangeable Core	As Required	626	RU	087100
1 Cylinder (Dogging)	As Required	626	RU	087100
1 Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100
1 Conc Overhead Stop	6-X36	630	RF	087100
1 Surface Closer	PR7500 (Arm to suit)	600x689	NO	087100
1 Gasketing	290APK x 2891APK		PE	087100
1 Rain Guard	346C (Omit at overhangs)		PE	087100
1 Sweep	3452CNB x Length Required		PE	087100
1 Threshold	273x224AFGT x Length Required		PE	087100

Notes: Perimeter/meeting seals by frame/door supplier.

Set: 3.0

Doors: 107

1 Continuous Hinge	CFM-HD1 x Length Required		PE	087100
1 Rim Exit Device, Nightlatch	PED5257 M52 K157ET CTP	630	RU	087100
2 Interchangeable Core	As Required	626	RU	087100
1 Cylinder (Dogging)	As Required	626	RU	087100
1 Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100
1 Surface Closer	UNI7500	600x689	NO	087100
1 Gasketing	290APK x 2891APK		PE	087100
1 Rain Guard	346C (Omit at overhangs)		PE	087100
1 Sweep	3452CNB x Length Required		PE	087100

1	Threshold	273x224AFGT x Length Required	PE	087100

Set: 4.0

Doors: 158.1

2	Continuous Hinge	CFM-HD1 x Length Required	PE	087100
1	Mullion	CR900KM (Size as required)	RU	087100
1	Rim Exit Device, Nightlatch	PED5257 M52 K157ET CTP	630	RU 087100
1	Rim Exit Device, Exit Only	PED5201 M52 EO CTP	630	RU 087100
4	Interchangeable Core	As Required	626	RU 087100
1	Housing (Mullion)	As Required	626	RU 087100
2	Cylinder (Dogging)	As Required	626	RU 087100
2	Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO 087100
2	Surface Closer	UNI7500	600x689	NO 087100
1	Gasketing	290APK x 2891APK	PE	087100
1	Rain Guard	346C (Omit at overhangs)	PE	087100
1	Gasketing	5110BL	PE	087100
2	Sweep	3452CNB x Length Required	PE	087100
1	Threshold	273x224AFGT x Length Required	PE	087100

Set: 5.0

Doors: 140.1

2	Continuous Hinge	CFM-SLF-HD1 PT x Length Required	PE	087100
2	Electric Power Transfer	EL-CEPT	630	SU 087100 ✂
1	Mullion	CR900KM (Size as required)	RU	087100
1	Rim Exit Device	PED5233-IN220 [A] 1029133PT BIPS M35	630	RU 087100 ✂
1	Rim Exit Device	PED5234-IN220 [A] 1029134PT BIPS CTP M35	630	RU 087100 ✂
2	Interchangeable Core	As Required	626	RU 087100
1	Housing (Mullion)	As Required	626	RU 087100
2	Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO 087100
2	Surface Closer	UNI7500	600x689	NO 087100
1	Gasketing	290APK x 2891APK	PE	087100
1	Rain Guard	346C (Omit at overhangs)	PE	087100
1	Gasketing	5110BL	PE	087100
2	Sweep	3452CNB x Length Required	PE	087100

1	Threshold	273x224AFGT x Length Required	PE	087100	
1	ElectroLynx Harness - Frame	QC-C1500P	MK	087100	↗
1	ElectroLynx Harness - Door	QC-C x Length Required	MK	087100	↗
1	Power Supply	AQL4-R8E1 x Relays as Required	SU	087100	↗
1	Wiring Diagram	Elevation and Point to Point as Specified	OT		

Notes:

Operational narrative: Doors normally closed and secure. Access by valid credential or key. Free egress always. Doors remain latched and secure upon power loss or fire alarm activation. Access control system monitors door position (DPS) and verifies valid egress via REX.

Set: 6.0

Doors: 139.1, 139.2

6	Hinge, Full Mortise, Hvy Wt	T4A3386 [NRP] FT	US32D	MK	087100
1	Dust Proof Strike	570	US26D	RO	087100
1	Flush Bolt	2845 / 2942 (As required)	US32D	RO	087100
1	Classroom Intruder Lock	ML2052 102T CTP	630	RU	087100
2	Interchangeable Core	As Required	626	RU	087100
1	Coordinator	2600 (Size & Mtg brackets as required)	US28	RO	087100
2	Surface Closer	7500 (Arm to suit)	689	NO	087100
1	Gasketing	290APK x 2891APK		PE	087100
2	Sweep	3452CNB x Length Required		PE	087100
1	Threshold	273x224AFGT x Length Required		PE	087100

Set: 7.0

Doors: C100

2	Continuous Hinge	CFM-SLF-HD1 x Length Required		PE	087100
2	Dummy Bar	PED5000ADB	630	RU	087100
2	Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100
2	Conc Overhead Stop	6-X36	630	RF	087100
1	Surface Closer	7500 (Arm to suit)	689	NO	087100
1	Automatic Opener	6300 Series	689	NO	087100 ↗
2	Sweep	3452CNB x Length Required		PE	087100
1	Threshold	271A		PE	087100
2	Door Switch	503/504/505 (As required)		NO	087100 ↗

1 Wiring Diagram Elevation and Point to Point as Specified OT

Notes: Coordinate door switches with Set 1.0 (Door 100).

Operational narrative: Doors normally closed with push/pull operation. Hands free entry/egress by operator via door switches.

Set: 8.0

Doors: 200A

1 Continuous Hinge	CFM-SLF-HD1 x Length Required		PE	087100
1 Dummy Bar	PED5000ADB	630	RU	087100
1 Pull	RM5277 (Size & Mtg-Type as required)	US32D	RO	087100
1 Conc Overhead Stop	6-X36	630	RF	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Sweep	3452CNB x Length Required		PE	087100
1 Threshold	271A		PE	087100

Set: 9.0

Doors: 118, 119, 212, 213

1 Sliding Door Hdwe	SGS SGS-SC-2	US32D	GS	084126
1 Pull, BTB Glass Mtg	RM5275 Mtg-Type 13HD (Size as required)	US32D	RO	087100

Notes: Verify glass door hardware meets design intent prior to submittals.

Set: 10.0

Doors: 229

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Rim Exit Device	PED5257 [A] 102957PT	630	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 11.0

Doors: 140.2

6 Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100
1 Mullion	CR900KM (Size as required)		RU	087100
2 Rim Exit Device, Classroom	PED5255 [A] 102955PT CTP	630	RU	087100
3 Interchangeable Core	As Required	626	RU	087100
1 Housing (Mullion)	As Required	626	RU	087100
2 Surface Closer	7500 (Arm to suit)	689	NO	087100
2 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
2 Silencer	608		RO	087100

Set: 12.0

Doors: 158.2, 168, 200

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	↗
1	Rim Exit Device	PED5234-IN220 [A] 1029134PT BIPS CTP M35	630	RU	087100	↗
1	Interchangeable Core	As Required	626	RU	087100	
1	Surface Closer	7500 (Arm to suit)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
3	Silencer	608		RO	087100	
1	ElectroLynx Harness - Frame	QC-C1500P		MK	087100	↗
1	ElectroLynx Harness - Door	QC-C x Length Required		MK	087100	↗
1	Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Access by valid credential or key. Free egress always. Door remains latched and secure upon power loss or fire alarm activation. Access control system monitors door position (DPS) and verifies valid egress via REX.

Set: 12.1

Doors: D1, D3.2

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Electric Power Transfer	EL-CEPT	630	SU	087100	↗
1	Rim Exit Device	PED5234-IN220 [A] 1029134PT BIPS CTP M35	630	RU	087100	↗
1	Interchangeable Core	As Required	626	RU	087100	

1	Surface Closer	CPS7500	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
3	Silencer	608		RO	087100	
1	ElectroLynx Harness - Frame	QC-C1500P		MK	087100	↗
1	ElectroLynx Harness - Door	QC-C x Length Required		MK	087100	↗
1	Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Access by valid credential or key. Free egress always. Door remains latched and secure upon power loss or fire alarm activation. Access control system monitors door position (DPS) and verifies valid egress via REX.

Set: 13.0

Doors: 123, D3.1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Rim Exit Device, Classroom	PED5255 [A] 102955PT CTP	630	RU	087100	
1	Interchangeable Core	As Required	626	RU	087100	
1	Surface Closer	CPS7500	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
3	Silencer	608		RO	087100	

Notes: Door 123: Omit kickplate, seals by door/frame mfg.

Set: 14.0

Doors: 105, C109.1, C109.2, C110

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Rim Exit Device, Classroom	PED5255 [A] 102955PT CTP	630	RU	087100	
1	Interchangeable Core	As Required	626	RU	087100	
1	Surface Closer	CPS7500	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	

Set: 15.0

Doors: ST-4.1, ST-4.2, ST-5.0, ST-5.1

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Rim Exit Device, Passage	PED5210 [A] 102910PT	630	RU	087100	

1	Surface Closer	2800ST	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	

Set: 16.0

Doors: 137, 148, 149, 159, 161, 215, 216, 217, D2

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Access Control Mort Lock	IN220-ML20134 102T BIPS CTP	626	RU	281500	✂
1	Interchangeable Core	As Required	626	RU	087100	
1	Surface Closer	7500 (Arm to suit)	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
3	Silencer	608		RO	087100	
1	Antenna	EXT-10-ANT (As Required)		HS	281500	
1	Hub	AH40IN2NNNN (Consolidate where feasible)		RU	281500	✂
1	Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Presentation of valid credential momentarily unlocks trim. Free egress. REX signals valid exit. Door position switches monitor open/closed status. Door remains latched and secure in event of power loss or fire alarm.

Set: 17.0

3	Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1	Access Control Mort Lock	IN220-ML20134 102T BIPS CTP	626	RU	281500	✂
1	Interchangeable Core	As Required	626	RU	087100	
1	Surface Closer	CPS7500	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
3	Silencer	608		RO	087100	
1	Antenna	EXT-10-ANT (As Required)		HS	281500	
1	Hub	AH40IN2NNNN (Consolidate where feasible)		RU	281500	✂
1	Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Presentation of valid credential momentarily unlocks trim. Free egress. REX signals valid exit. Door position switches monitor open/closed status. Door remains latched and

secure (fail secure) in event of power loss or fire alarm.

Set: 18.0

Doors: [C111](#)

3 Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1 Access Control Mort Lock	IN220-ML20134 102T BIPS CTP	626	RU	281500	↗
1 Interchangeable Core	As Required	626	RU	087100	
1 Conc Overhead Stop	1-X36	689	RF	087100	
1 Surface Closer	7500 (Arm to suit)	689	NO	087100	
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
3 Silencer	608		RO	087100	
1 Antenna	EXT-10-ANT (As Required)		HS	281500	
1 Hub	AH40IN2NNNN (Consolidate where feasible)		RU	281500	↗
1 Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Presentation of valid credential momentarily unlocks trim. Free egress. REX signals valid exit. Door position switches monitor open/closed status. Door remains latched and secure (fail secure) in event of power loss or fire alarm.

Set: 19.0

Doors: [136](#)

6 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100	
1 Dust Proof Strike	570	US26D	RO	087100	
2 Flush Bolt	555 / 557 (As required)	US26D	RO	087100	
1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100	
1 Interchangeable Core	As Required	626	RU	087100	
1 Surface Closer	CPS7500	689	NO	087100	
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
1 Gasketing	S88BL (Head & Jambs)		PE	087100	

Set: 20.0

Doors: [145](#), [158](#)

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100	

1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 21.0

Doors: 116B, 210, 211, C108, D17, D19, D3.3, D3.5, D37, D39

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 22.0

Doors: 104A, 106A, 116A, 133, 135, C104, D11A

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Surface Closer	CPS7500	689	NO	087100
3 Silencer	608		RO	087100

Set: 23.0

Doors: 127A

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Conc Overhead Stop	2-X36	630	RF	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
3 Silencer	608		RO	087100

Set: 24.0

Doors: 003, 102

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Storeroom Lock	CLX3357 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100

1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100

Set: 25.0

Doors: 110, 111, 112, 113, 114, 115, 120, 121, 125, 126, 128, 130, 134, 142, 151, 154, 155, 157.1, 157.2, 162, 205, 207, 222, 224, D2.2, D2.3, D2.4, D20, D21, D22, D23, D24, D25, D26, D33, D34

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Entrance Lock	CLX3351 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 26.0

Doors: 152, 153, 156, 160, C106, C107, C112, D2.5, D38

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Classroom Lock	CLX3355 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 27.0

Doors: 117, 124, 204

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Classroom Lock	CLX3355 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Rain Guard	346C (Omit at overhangs)		PE	087100

Set: 28.0

Doors: 116, 203, 208, 209.1, 209.2, 214, D3.4, D32, D35

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Classroom Lock	CLX3355 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100

1 Silencer	608		RO	087100

Set: 29.0

Doors: 105A, 105B, D1.1

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Classroom Lock	CLX3355 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Surface Closer	CPS7500	689	NO	087100
3 Silencer	608		RO	087100

Set: 30.0

Doors: 127.1, 127.2, 132

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Classroom Lock	CLX3355 102D CTP	626	RU	087100
1 Interchangeable Core	As Required	626	RU	087100
1 Conc Overhead Stop	2-X36	630	RF	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
3 Silencer	608		RO	087100

Set: 31.0

Doors: 138.2, 141

6 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Dust Proof Strike	570	US26D	RO	087100
2 Flush Bolt	555 / 557 (As required)	US26D	RO	087100
1 Passage Latch	CLX3310 102D	626	RU	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
2 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
2 Silencer	608		RO	087100

Set: 32.0

Doors: 220

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Passage Latch	CLX3310 102D	626	RU	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 33.0

Doors: 131, 150

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Passage Latch	CLX3310 102D	626	RU	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
3 Silencer	608		RO	087100

Set: 34.0

Doors: 138.1

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Passage Latch	CLX3310 102D	626	RU	087100
1 Conc Overhead Stop	2-X36	630	RF	087100
1 Surface Closer	7500 (Arm to suit)	689	NO	087100
3 Silencer	608		RO	087100

Set: 35.0

Doors: 101, 106, 143, 144, 146, 147, 218, 219, D15, D18

3 Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100
1 Privacy Lock	ML2060 102T M34 V21	626	RU	087100
1 Surface Closer	2800ST	689	NO	087100
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100
1 Gasketing	S88BL (Head & Jambs)		PE	087100
1 Coat Hook	RM801	US26D	RO	087100

Set: 35.1

Doors: C105

3	Hinge, Full Mortise	TA2714 [NRP] FT	US26D	MK	087100	
1	Access Control Mort Lock	IN220-ML20134 102T BIKPS CTP	626	RU	281500	✂
1	Hub	AH20W14		HS	281500	✂
1	Surface Closer	2800ST	689	NO	087100	
1	Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1	Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
1	Gasketing	S88BL (Head & Jambs)		PE	087100	
1	Antenna	EXT-10-ANT (As Required)		HS	281500	

1 Hub	AH40IN2NNNN (Consolidate where feasible)		RU	281500	⚡
1 Coat Hook	RM801	US26D	RO	087100	
1 Wiring Diagram	Elevation and Point to Point as Specified		OT		

Notes:

Operational narrative: Door normally closed and secure. Presentation of valid credential momentarily unlocks trim. Free egress. REX signals valid exit. Door position switches monitor open/closed status. Door remains latched and secure (fail secure) in event of power loss or fire alarm. Privacy button for local lockdown to prevent access while in use.

Set: 36.0

Doors: 103, 104, 201, 202, C102, C103

1 Hinge, Full Mortise, Hvy Wt	T4A3786 [NRP] FT	US26D	MK	087100	
1 Push Plate	70C-RKW	US32D	RO	087100	
1 Pull	RM5275 (Size & Mtg-Type as required)	US32D	RO	087100	
1 Surface Closer	2800ST	689	NO	087100	
1 Kick Plate	K1050 10" high BEV CSK	US32D	RO	087100	
1 Wall Stop	RM860 (or) RM861 (As Required)	US26D	RO	087100	
1 Silencer	608		RO	087100	

Set: 37.0

Doors: 001, 002

1 Door Hardware	Hardware by door manufacturer		OT		

Set: 38.0

Doors: 221, 221A

1 Other	See notes		OT		

Notes: Friend's bookstore doors by separate vendor.

Set: 39.0

Doors: 139.3, 139.4, 164

1 Door Hardware	Hardware by overhead door manufacturer		OT		

END OF SECTION 080671

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.
3. Interior custom hollow-metal doors and frames.
4. Exterior custom hollow-metal doors and frames.

B. Related Requirements:

1. Section 081119 "Stainless-Steel Doors and Frames" for hollow-metal doors and frames manufactured from stainless steel.
2. Section 083473.13 "Metal Sound Control Door Assemblies" for packaged, acoustically rated hollow-metal door and frame assemblies.
3. [Section 087100 "Door Hardware"] [Section 087111 "Door Hardware (Descriptive Specification)"] for door hardware for hollow-metal doors.
4. Section 119812 "Detention Doors and Frames" for hollow-metal doors and frames for detention facilities.
5. Section 134900 "Radiation Protection" for lead-lined, hollow-metal doors and frames.

1.2 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings in accordance with NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.3 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.
- B. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.
3. Interior custom hollow-metal doors and frames.
4. Exterior custom hollow-metal doors and frames.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, core descriptions, [fire-resistance ratings,][temperature-rise ratings,] and finishes.

C. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.

D. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
7. Details of anchorages, joints, field splices, and connections.
8. Details of accessories.
9. Details of moldings, removable stops, and glazing.

E. Samples for Initial Selection: For hollow-metal doors and frames with factory-applied color finishes.

F. Samples for Verification:

1. Finishes: For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. Fabrication: Prepare Samples approximately [12 by 12 inches][8 by 10 inches]<Insert dimension> to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

- G. Product Schedule: For hollow-metal doors and frames, prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final door hardware schedule.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 - 3. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Product Test Reports: For each type of [fire-rated hollow-metal door and frame assembly][fire-rated borrowed-lite assembly][windborne-debris impact resistance door][and][thermally rated door assemblies] for tests performed by a qualified testing agency indicating compliance with performance requirements.
- C. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.
- D. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.8 QUALITY ASSURANCE

- A. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.
- B. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies is to meet the qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 - 1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAI) certification.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal doors and frames palletized, packaged, or crated to provide

protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal doors and frames vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 HOLLOW METAL DOORS AND FRAMES

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Airtec Corporation]
 2. [Apex Industries, Inc]
 3. [BARON Metal Industries, Inc.; ASSA ABLOY of Canada, Ltd.; ASSA ABLOY]
 4. [Ceco Door; AADG, Inc.; ASSA ABLOY]
 5. [Concept Frames, AADG, Inc.; ASSA ABLOY Group]
 6. [Curries, AADG, Inc.; ASSA ABLOY Group]
 7. [Custom Metal Products]
 8. [Daybar Industries, Ltd]
 9. [DCI Hollow Metal on Demand]
 10. [DE LA FONTAINE]
 11. [Deansteel Manufacturing Company, Inc.]
 12. [Deronde Products]
 13. [DKS Steel Door & Frame Systems, Inc.]
 14. [Expi-Door Systems, Inc.]
 15. [Fleming Door Products Ltd.; ASSA ABLOY Group]
 16. [Gensteel Doors]
 17. [HMF Express]
 18. [Hollow Metal Xpress]
 19. [JR Metal Frames, Inc.]
 20. [Karpen Steel Custom Doors & Frames]
 21. [L.I.F. Industries, Inc]
 22. [LaForce, LLC]
 23. [MegaMet Industries]
 24. [Mesker Door; Mesker Openings Group]
 25. [Metropolitan Door Industries Corp.]
 26. [Michbi Doors Inc]
 27. [MPI Group, LLC (The)]
 28. [National Custom Hollow Metal Doors & Frames]
 29. [North American Door Corp]

30. [Philipp Manufacturing Co (The)]
31. [Pioneer Industries; AADG, Inc.; ASSA ABLOY]
32. [Premier Products, Inc]
33. [Republic Doors and Frames; a Allegion brand]
34. [Rocky Mountain Metals, Inc]
35. [Security Metal Products; a brand of ASSA ABLOY]
36. [Steelcraft; Allegion plc]
37. [Steward Steel, Door & Frame Division]
38. [Stiles Custom Metal, Inc]
39. [Titan Metal Products]
40. [Trillium Steel Doors Limited]
41. [West Central Manufacturing, Inc.]
42. <Insert manufacturer's name>

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings[and temperature-rise limits] indicated on Drawings, based on testing at positive pressure in accordance with NFPA 252 or UL 10C.
 1. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.
 2. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 3. Temperature-Rise Limit: [Where indicated on Drawings][At vertical exit enclosures and exit passageways], provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Fire-Rated, Borrowed-Lite Assemblies: Assemblies complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing in accordance with NFPA 257 or UL 9.
- C. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone [1][2][3][4] for [basic][enhanced] protection.
 1. Large-Missile Test: For glazed openings located within [30 feet]<Insert dimension> of grade.
- D. Thermally Rated Door Assemblies: Provide door assemblies with U-factor of not more than [0.50 deg Btu/F x h x sq. ft.][0.40 deg Btu/F x h x sq. ft.][0.38 deg Btu/F x h x sq. ft.]<Insert U-factor> when tested in accordance with ASTM C1363 or ASTM E1423.

2.3 INTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Standard-Duty Doors and Frames: ANSI/SDI A250.8, Level 1; ANSI/SDI A250.4, Level C. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: [1-3/4 inches][1-3/8 inches].
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.032 inch.
 - d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
 - f. Core: [Manufacturer's standard][Kraft-paper honeycomb][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - g. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated]doors.
 - 2. Frames:
 - a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.042 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].
 - 3. Exposed Finish: [Prime][Factory].
- C. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].

- f. Core: [Manufacturer's standard][Kraft-paper honeycomb][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - g. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated]doors.
 - 2. Frames:
 - a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].
 - 3. Exposed Finish: [Prime][Factory].
- D. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
 - 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch.
 - d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless][Model 3, Stile and Rail].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
 - f. Core: [Manufacturer's standard][Kraft-paper honeycomb][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - g. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated]doors.
 - 2. Frames:
 - a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].
 - 3. Exposed Finish: [Prime][Factory].
- E. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert

locations>.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule on Drawings.
- b. Thickness: 1-3/4 inches.
- c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.067 inch.
- d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless].
- e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
- f. Core: [Manufacturer's standard][Kraft-paper honeycomb][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
- g. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated] doors.

2. Frames:

- a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.067 inch.
- b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
- c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].

3. Exposed Finish: [Prime][Factory].

2.4 EXTERIOR STANDARD STEEL DOORS AND FRAMES

- A. Construct hollow-metal doors and frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
- B. Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 2; ANSI/SDI A250.4, Level B. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule on Drawings.
- b. Thickness: 1-3/4 inches.
- c. Face: Metallic-coated steel sheet, minimum thickness of 0.042 inch, with minimum [A40][A60] coating.
- d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless].
- e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
- f. Top Edge Closures: Close top edges of doors with flush closures of same

- material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors[where required for attachment of weather stripping] with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: [Manufacturer's standard][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - i. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener with insulation][laminated mineral board] core for fire-rated doors.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum [A40][A60] coating.
 - b. Construction: [Knocked down][Face welded][Full profile welded].
 - 3. Exposed Finish: [Prime][Factory].
- C. Extra-Heavy-Duty Doors and Frames: ANSI/SDI A250.8, Level 3; ANSI/SDI A250.4, Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
- 1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum [A40][A60] coating.
 - d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless][Model 3, Stile and Rail].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors[where required for attachment of weather stripping] with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: [Manufacturer's standard][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - i. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener with insulation][laminated mineral board] core for fire-rated doors.
 - 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum [A40][A60] coating.
 - b. Construction: [Knocked down][Face welded][Full profile welded].

3. Exposed Finish: [Prime][Factory].
- D. Maximum-Duty Doors and Frames: ANSI/SDI A250.8, Level 4; ANSI/SDI A250.4, Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum [A40][A60] coating.
 - d. Edge Construction: [Model 1, Full Flush][Model 2, Seamless].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches][Provide manufacturer's standard beveled or square edges].
 - f. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - g. Bottom Edges: Close bottom edges of doors[where required for attachment of weather stripping] with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - h. Core: [Manufacturer's standard][Polystyrene][Polyurethane][Polyisocyanurate][Vertical steel stiffener].
 - i. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener with insulation][laminated mineral board] core for fire-rated doors.
 2. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch, with minimum [A40][A60] coating.
 - b. Construction: [Knocked down][Face welded][Full profile welded].
 3. Exposed Finish: [Prime][Factory].

2.5 INTERIOR CUSTOM HOLLOW-METAL DOORS AND FRAMES

- A. Hollow-Metal Doors and Frames: NAAMM-HMMA 860; ANSI/SDI A250.4, Physical Performance Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
1. Doors:
 - a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of [0.032 inch][0.042 inch][0.053 inch].
 - d. Edge Construction: [Continuously welded with no][Projection or tack welded with no][Interlocking with][Projection or tack welded with] visible

- seam.
 - e. Core: Steel stiffened.
 - f. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated] doors.
2. Frames:
- a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].
3. Exposed Finish: Prime.
- B. Commercial Doors and Frames: NAAMM-HMMA 861; ANSI/SDI A250.4, Physical Performance Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
1. Doors:
- a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Continuously welded with no visible seam.
 - e. Core: Steel stiffened.
 - f. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated] doors.
2. Frames:
- a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch, except 0.067 inch for openings exceeding 4 feet wide.
 - b. Sidelite and Transom Frames: Fabricated from same material as adjacent door frame.
 - c. Construction: [Face][Full profile] welded.
3. Exposed Finish: Prime.
- C. Commercial Laminated Doors and Frames: NAAMM-HMMA 867; ANSI/SDI A250.4, Physical Performance Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.
1. Doors:
- a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: [Uncoated][Metallic-coated] steel sheet, minimum thickness of [0.032 inch][0.042 inch][0.053 inch].

- d. Edge Construction: [Continuously welded with no visible seam][Interlocking with visible seam][Interlocking with no visible seam][Projection, spot, or tack welded with or without visible seams].
 - e. Edge Bevel: [Bevel lock and hinge edges 1/8 inch in 2 inches][Bevel lock edge 1/8 inch in 2 inches].
 - f. Core: [Kraft-paper honeycomb][Polyisocyanurate][Polystyrene][Polyurethane][Vertical steel stiffener].
 - g. Fire-Rated Core: Manufacturer's standard [vertical steel stiffener][laminated mineral board] core for fire-rated [and temperature-rise-rated] doors.
2. Frames:
- a. Materials: [Uncoated][Metallic-coated] steel sheet, minimum thickness of 0.053 inch.
 - b. Sidelite and Transom Frames: Fabricated from same thickness material as adjacent door frame.
 - c. Construction: [Knocked down][Slip-on drywall][Face welded][Full profile welded].
3. Exposed Finish: [Prime][Unprimed].

2.6 EXTERIOR CUSTOM HOLLOW-METAL DOORS AND FRAMES

- A. Commercial Doors and Frames: NAAMM-HMMA 861; ANSI/SDI A250.4, Physical Performance Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.

1. Doors:
- a. Type: As indicated in the Door and Frame Schedule on Drawings.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60 or A60 coating.
 - d. Edge Construction: Continuously welded with no visible seam.
 - e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
 - f. Bottom Edges: Close bottom edges of doors[where required for attachment of weather stripping] with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
 - g. Core: Steel stiffened.
2. Frames:
- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, except 0.067 inch for openings exceeding 4 feet wide; with minimum G60 or A60 coating.
 - b. Construction: [Face][Full profile] welded.

3. Exposed Finish: Prime.

- B. Commercial Laminated Doors and Frames: NAAMM-HMMA 867; ANSI/SDI A250.4, Physical Performance Level A. [At locations indicated in the Door and Frame Schedule on Drawings]<Insert locations>.

1. Doors:

- a. Type: As indicated in the Door and Frame Schedule on Drawings.
- b. Thickness: 1-3/4 inches.
- c. Face: Metallic-coated steel sheet, minimum thickness of [0.053 inch][0.042 inch], with minimum G60 or A60 coating.
- d. Edge Construction: [Continuously welded with no visible seam][Interlocking with visible seam][Interlocking with no visible seam][Projection, spot, or tack welded with or without visible seams].
- e. Top Edge Closures: Close top edges of doors with flush closures of same material as face sheets. Seal joints against water penetration.
- f. Bottom Edges: Close bottom edges of doors[where required for attachment of weather stripping] with end closures or channels of same material as face sheets. Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape.
- g. Core: [Kraft-paper honeycomb][Polyisocyanurate][Polystyrene][Polyurethane][Vertical steel stiffener].

2. Frames:

- a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum G60 or A60 coating.
- b. Construction: [Knocked down][Face welded][Full profile welded].

3. Exposed Finish: [Prime][Unprimed].

2.7 BORROWED LITES

- A. Fabricate of [uncoated][metallic-coated] steel sheet, minimum thickness of [0.053 inch][0.042 inch].
- B. Construction: [Knocked down][Face welded][Full profile welded].
- C. Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as metal as frames.
- D. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.

2.8 HOLLOW-METAL PANELS

- A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.9 FRAME ANCHORS

- A. Jamb Anchors:
 - 1. Type: Anchors of minimum size and type required by applicable door and frame standard, and suitable for performance level indicated.
 - 2. Quantity: Minimum of three anchors per jamb, with one additional anchor for frames with no floor anchor. Provide one additional anchor for each 24 inches of frame height above 7 feet.
 - 3. Postinstalled Expansion Anchor: Minimum 3/8-inch- diameter bolts with expansion shields or inserts, with manufacturer's standard pipe spacer.
- B. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor.
- C. Floor Anchors for Concrete Slabs with Underlayment: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at top of underlayment.
- D. Material: ASTM A879/A879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 - 1. For anchors built into exterior walls, steel sheet complying with ASTM A1008/A1008M or ASTM A1011/A1011M; hot-dip galvanized in accordance with ASTM A153/A153M, Class B.

2.10 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- B. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- C. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- D. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.
- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

- G. Mineral-Fiber Insulation: ASTM C665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E136 for combustion characteristics.
- H. Glazing: Comply with requirements in Section 088000 "Glazing."

2.11 FABRICATION

- A. Door Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- B. Hollow-Metal Frames: Fabricate in one piece except where handling and shipping limitations require multiple sections. Where frames are fabricated in sections, provide alignment plates or angles at each joint, fabricated of metal of same or greater thickness as frames.
 - 1. Sidelite and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by welding[, or by rigid mechanical anchors].
 - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 - 3. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
 - 4. Terminated Stops (Hospital Stops): Terminate stops [6 inches]<Insert dimension> above finish floor with a [45][90]-degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.
- C. Hardware Preparation: Factory prepare hollow-metal doors and frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping in accordance with ANSI/SDI A250.6, the Door Hardware Schedule on Drawings, and templates.
 - 1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 - 2. Comply with BHMA A156.115 for preparing hollow-metal doors and frames for hardware.
- D. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with [butted][or][mitered] hairline joints.
 - 1. Provide stops and moldings flush with face of door, and with [beveled][square]

- stops unless otherwise indicated.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames. Provide loose stops and moldings on inside of hollow-metal doors and frames.
 4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
 5. Provide stops for installation with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

2.12 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.
- B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with ANSI/SDI A250.3.
 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.13 LOUVERS

- A. Provide louvers for interior doors, where indicated, which comply with SDI 111, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch- thick steel frame.
 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
 2. Lightproof Louver: Stationary louvers constructed with baffles to prevent light from passing from one side to the other.
 3. Fire-Rated Automatic Louvers: Louvers constructed with movable blades closed by actuating fusible link, and listed and labeled for use in fire-rated door assemblies of type and fire-resistance rating indicated by same qualified testing and inspecting agency that established fire-resistance rating of door assembly.
- B. Form corners of moldings with hairline joints. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

PART 3 - EXECUTION

3.1 PREPARATION

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

3.2 INSTALLATION

- A. Install hollow-metal doors and frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions.
- B. Hollow-Metal Frames: Comply with [ANSI/SDI A250.11][NAAMM-HMMA 840].
 - 1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces without damage to completed Work.
 - a. Where frames are fabricated in sections, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces. Touch-up finishes.
 - b. Install frames with removable stops located on secure side of opening.
 - 2. Fire-Rated Openings: Install frames in accordance with NFPA 80.
 - 3. Floor Anchors: Secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 - 4. Solidly pack mineral-fiber insulation inside frames.
 - 5. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.
 - 6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors.[Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.]
 - 7. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs

- d. on parallel lines, and perpendicular to plane of wall.
Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.
 - 1. Non-Fire-Rated Steel Doors: Comply with [ANSI/SDI A250.8][NAAMM-HMMA 841 and NAAMM-HMMA guide specification indicated].
 - 2. Fire-Rated Doors: Install doors with clearances in accordance with NFPA 80.
 - 3. Smoke-Control Doors: Install doors in accordance with NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: [Owner will engage][Engage] a qualified inspector to perform inspections and to furnish reports to Architect.
- B. Inspections:
 - 1. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
 - 2. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in [NFPA 80][and][NFPA 101].

3.4 REPAIR

- A. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- B. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint in accordance with manufacturer's written instructions.
- C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish in accordance with manufacturer's written instructions.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid-core five-ply flush wood veneer-faced doors and transom panels for transparent finish.
2. Solid-core five-ply flush wood doors and transom panels for opaque finish.
3. Solid-core flush wood doors and transom panels with plastic-laminate-faces.
4. Hollow-core flush wood doors with plastic-laminate faces.

B. Related Requirements:

1. Section 064023 "Interior Architectural Woodwork" for wood door frames[including 20-minute fire-rated wood door frames].
2. Section 064216 "Flush Wood Paneling" for requirements for veneers from the same flitches for both flush wood doors and flush wood paneling.
3. Section 083473.16 "Wood Sound Control Door Assemblies" for acoustic flush wood doors.
4. Section 088000 "Glazing" for glass view panels in flush wood doors.
5. [Section 099113 "Exterior Painting"] [Section 099123 "Interior Painting"] [and] [Section 099300 "Staining and Transparent Finishing"] for field finishing doors.
6. Section 134900 "Radiation Protection" for lead-lined flush wood doors.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-core five-ply flush wood veneer-faced doors and transom panels for transparent finish.
2. Solid-core five-ply flush wood doors and transom panels for opaque finish.
3. Solid-core seven-ply flush wood veneer-faced doors and transom panels for transparent finish.
4. Solid-core seven-ply flush wood doors and transom panels for opaque finish.
5. Solid-core flush wood doors and transom panels with plastic-laminate-faces.
6. Hollow-core flush wood veneer-faced doors for transparent finish.
7. Hollow-core flush wood doors for opaque finish.
8. Hollow-core flush wood doors with plastic-laminate faces.
9. Fire-rated wood door frames.

10. Light frames and louvers.
- B. Product Data Submittals: For each product, including the following:
1. Door core materials and construction.
 2. Door edge construction
 3. Door face type and characteristics.
 4. Door louvers.
 5. Door trim for openings.
 6. Door frame construction.
 7. Factory-machining criteria.
 8. Factory-[priming][finishing] specifications.
- C. Sustainable Design Submittals:
1. Third-Party Certifications: For each product.
 2. Third-Party Certified Life Cycle Assessment: For each product.
 3. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.
- D. Shop Drawings: Indicate location, size, and hand of each door; elevation of each type of door; construction details not covered in Product Data; and the following:
1. Door schedule indicating door[and frame] location, type, size, fire protection rating, and swing.
 2. Door elevations, dimension and locations of hardware, lite and louver cutouts, and glazing thicknesses.
 3. Details of frame for each frame type, including dimensions and profile.
 4. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
 5. Dimensions and locations of blocking for hardware attachment.
 6. Dimensions and locations of mortises and holes for hardware.
 7. Clearances and undercuts.
 8. Requirements for veneer matching.
 9. Doors to be factory [primed][finished] and application requirements.
 10. Apply [AWI Quality Certification][WI Certified Compliance] Program label to Shop Drawings.
- E. Samples for Initial Selection: For [plastic-laminate door faces][polymer edging][factory-finished doors][and][factory-finished door frames].
- F. Samples for Verification:
1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish.[For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.]
 2. Plastic laminate, 6 inches square, for each color, texture, and pattern selected.
 3. Polymer edging, in manufacturer's standard colors.
 4. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.

5. Louver blade and frame sections, 6 inches long, for each material and finish specified.
6. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For door inspector.
 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 2. Egress Door Inspector: Submit documentation of compliance with NFPA 101, Section 7.2.1.15.4.
 3. Submit copy of DHI's Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Field quality-control reports.
- C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Special warranties.
- B. Quality Standard Compliance Certificates: [AWI Quality Certification][WI Certified Compliance] Program certificates.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Certification: Licensed participant in [AWI's Quality Certification Program][WI's Certified Compliance Program].
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality-control inspections of fire-rated door assemblies complies with qualifications set forth in NFPA 80, Section 5.2.3.1 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.
- C. Egress Door Inspector Qualifications: Inspector for field quality-control inspections of egress door assemblies complies with qualifications set forth in NFPA 101, Section 7.2.1.15.4 and the following:
 1. DHI's Fire and Egress Door Assembly Inspector (FDAI) certification.

1.7 DELIVERY, STORAGE, AND HANDLING

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

1.8 FIELD CONDITIONS

- A. Environmental Limitations:
 - 1. Do not deliver or install doors until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and HVAC system is operating and maintaining temperature and relative humidity at levels designed for building occupants for the remainder of construction period.
 - 2. Do not deliver or install doors until building is enclosed and weathertight, wet work is complete, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between [25 and 55][43 and 70][17 and 50]<Insert numbers> percent during remainder of construction period.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace doors[and frames] that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Delamination of veneer.
 - b. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
 - c. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
 - 2. Warranty also includes installation and finishing that may be required due to repair or replacement of defective doors[and frames].
 - 3. Warranty Period for Solid-Core Exterior Doors: Five years from date of Substantial Completion.
 - 4. Warranty Period for Solid-Core Interior Doors: Life of installation.
 - 5. Warranty Period for Hollow-Core Interior Doors: Two year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain flush wood doors [indicated to be blueprint matched with paneling][and wood

paneling] from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Wood Door and Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction, for fire-protection ratings [and temperature-rise limits] indicated on Drawings, based on testing at positive pressure in accordance with [UL 10C][or][NFPA 252].
 - 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 - 2. Temperature-Rise Limit: [Where indicated on Drawings][At vertical exit enclosures and exit passageways], provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
- B. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing in accordance with UL 1784 and installed in compliance with NFPA 105.

2.3 FLUSH WOOD DOORS AND FRAMES, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with [AWI/AWMAC/WI's "Architectural Woodwork Standards."][ANSI/WDMA I.S. 1A.]
 - 1. Provide [labels][and][certificates] from [AWI][WI] certification program indicating that doors[and frames] comply with requirements of grades specified.
 - a. This project has been registered with AWI as AWI Quality Certification Program Number <Insert number>.
 - b. Contractor registers the Work under this Section with the AWI Quality Certification Program at www.awiqcp.org or by calling 855-345-0991.
 - 2. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with the Contract Documents in addition to those of the referenced quality standard.

2.4 SOLID-CORE FIVE-PLY FLUSH WOOD VENEER-FACED DOORS AND TRANSOM PANELS FOR TRANSPARENT FINISH

- A. Interior Doors, Solid-Core Five-Ply Veneer-Faced:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not

limited to, the following]:

- a. [Lambton Doors]
 - b. [Lynden Door, Inc.]
 - c. [Masonite Architectural]
 - d. [Oregon Door]
 - e. [Oshkosh Door Company]
 - f. [VT Industries, Inc.]
 - g. [Wilsonart LLC]
 - h. <Insert manufacturer's name>
2. Performance Grade: ANSI/WDMA I.S. 1A [Extra Heavy Duty][Heavy Duty][Standard Duty][as indicated on Drawings].
 3. Performance Grade by Location:
 - a. ANSI/WDMA I.S. 1A Extra Heavy Duty: [Classrooms][public toilets][janitor's closets][assembly spaces][exits][and][patient rooms]<Insert locations>[and where indicated on Drawings].
 - b. ANSI/WDMA I.S. 1A Standard Duty: [Closets (not including janitor's closets)][and][private toilets]<Insert locations>[and where indicated on Drawings].
 4. ANSI/WDMA I.S. 1A Quality Grade: [Premium][Custom].
 5. Architectural Woodwork Standards Quality Grade: [Premium][Custom].
 6. Faces: Single-ply wood veneer not less than 1/50 inch thick.
 - a. Species: [Anigre][Select white ash][Figured select white ash][Select white birch][Select red birch][Cherry][Select red gum][Figured select red gum][Select white maple][Red oak][White oak][Persimmon][Sapele][Sycamore][Walnut]<Insert species>.
 - b. Cut: [Rotary cut][Plain sliced (flat sliced)][Quarter sliced][Rift cut].
 - c. Match between Veneer Leaves: [Book][Slip][Random] match.
 - d. Assembly of Veneer Leaves on Door Faces: [Center-balance][Balance][Running] match.
 - e. Pair and Set Match: Provide for doors hung in same opening[or separated only by mullions].
 - f. Room Match:
 - 1) Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by [10 feet][20 feet]<Insert dimension> or more.
 - 2) Provide door faces of compatible color and grain within each separate room or area of building.
 - g. Transom Match: [Continuous match][End match][As indicated].
 - h. Blueprint Match: Where indicated, provide doors with faces produced from same flitches as adjacent wood paneling and arranged to provide blueprint match with wood paneling. Comply with requirements in Section 064216 "Flush Wood Paneling."
 7. Exposed Vertical and Top Edges: [Same species as faces or a compatible

species - Architectural Woodwork Standards edge Type A][Same species as faces - Architectural Woodwork Standards edge Type A][Applied wood-veneer edges of same species as faces and covering edges of faces - Architectural Woodwork Standards edge Type B][Applied wood edges of same species as faces and covering edges of crossbands - Architectural Woodwork Standards edge Type D].

- a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Fire-Rated Pairs of Doors:
 - 1) Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - 2) Provide formed-steel edges and astragals with intumescent seals.
 - a) Finish steel edges and astragals with baked enamel[same color as doors].
 - b) Finish steel edges and astragals to match door hardware (locksets or exit devices).
 - c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: [550 lbf][475 lbf][400 lbf] in accordance with WDMA T.M. 10.
8. Core for Non-Fire-Rated Doors:
- a. ANSI A208.1, [Grade LD-1][Grade LD-2] particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as [needed to eliminate through-bolting hardware.][follows:]
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c) 5-inch midrail blocking, in doors indicated to have exit devices.
 - 2) Provide doors with [glued-wood-stave][or][WDMA I.S. 10 structural-composite-lumber] cores instead of particleboard cores for doors scheduled to receive exit devices in [Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]
 - b. Glued wood stave.
 - c. WDMA I.S. 10 structural composite lumber.

- 1) Screw Withdrawal, Door Face: [550 lbf][475 lbf][400 lbf].
- 2) Screw Withdrawal, Vertical Door Edge: [550 lbf][475 lbf][400 lbf].
- d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
9. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
 - a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as [needed to eliminate through-bolting hardware.][follows:]
 - 1) 5-inch top-rail blocking.
 - 2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - 3) 5-inch midrail blocking, in doors indicated to have armor plates.
 - 4) [4-1/2-by-10-inch lock blocks][5-inch midrail blocking], in doors indicated to have exit devices.
10. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.5 SOLID-CORE FIVE-PLY FLUSH WOOD DOORS AND TRANSOM PANELS FOR OPAQUE FINISH

A. Interior Doors, Solid-Core Five-Ply for Opaque Finish:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Lambton Doors]
 - b. [Lynden Door, Inc.]
 - c. [Masonite Architectural]
 - d. [Oregon Door]
 - e. [Oshkosh Door Company]
 - f. [VT Industries, Inc.]
 - g. <Insert manufacturer's name>
2. Performance Grade: ANSI/WDMA I.S. 1A [Extra Heavy Duty][Heavy Duty][Standard Duty][as indicated on Drawings].
3. Performance Grade by Location:
 - a. ANSI/WDMA I.S. 1A Extra Heavy Duty: [Classrooms][public toilets][janitor's closets][assembly spaces][exits][and][patient rooms]<Insert locations>[and where indicated on Drawings].
 - b. ANSI/WDMA I.S. 1A Standard Duty: [Closets (not including janitor's closets)][and][private toilets]<Insert locations>[and where indicated on

Drawings].

4. ANSI/WDMA I.S. 1A Quality Grade: [Premium][Custom].
5. Architectural Woodwork Standards Quality Grade: [Premium][Custom].
6. Faces: [MDO][Any closed-grain hardwood of mill option][Hardboard or MDF].
 - a. Apply MDO to [standard-thickness, closed-grain, hardwood face veneers][or][directly to high-density hardboard crossbands].
 - b. Hardboard Faces: ANSI A135.4, Class 1 (tempered) or Class 2 (standard).
 - c. MDF Faces: ANSI A208.2, Grade 150 or Grade 160.
7. Exposed Vertical and Top Edges: Any closed-grain hardwood.
 - a. Fire-Rated Single Doors: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed vertical edges.
 - b. Fire-Rated Pairs of Doors:
 - 1) Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
 - 2) Provide formed-steel edges and astragals with intumescent seals.
 - a) Finish steel edges and astragals with baked enamel[same color as doors].
 - b) Finish steel edges and astragals to match door hardware (locksets or exit devices).
 - c. Mineral-Core Doors: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.
 - 1) Screw-Holding Capability: [550 lbf][475 lbf][400 lbf] in accordance with WDMA T.M. 10.
8. Core for Non-Fire-Rated Doors:
 - a. ANSI A208.1, [Grade LD-1][Grade LD-2] particleboard.
 - 1) Blocking: Provide wood blocking in particleboard-core doors as [needed to eliminate through-bolting hardware.][follows:]
 - a) 5-inch top-rail blocking, in doors indicated to have closers.
 - b) 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
 - c) 5-inch midrail blocking, in doors indicated to have exit devices.
 - 2) Provide doors with [glued-wood-stave][or][WDMA I.S. 10 structural-composite-lumber] cores instead of particleboard cores for doors scheduled to receive exit devices in [Section 087100 "Door

Hardware.")[Section 087111 "Door Hardware (Descriptive Specification.)"]

- b. Glued wood stave.
 - c. WDMA I.S. 10 structural composite lumber.
 - 1) Screw Withdrawal, Door Face: [550 lbf][475 lbf][400 lbf].
 - 2) Screw Withdrawal, Vertical Door Edge: [550 lbf][475 lbf][400 lbf].
 - d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.
9. Core for Fire-Rated Doors: As required to achieve fire-protection rating indicated on Drawings.
- a. Blocking for Mineral-Core Doors: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated on Drawings as [needed to eliminate through-bolting hardware.][follows:]
 - 1) 5-inch top-rail blocking.
 - 2) 5-inch bottom-rail blocking, in doors indicated to have protection plates.
 - 3) 5-inch midrail blocking, in doors indicated to have armor plates.
 - 4) [4-1/2-by-10-inch lock blocks][5-inch midrail blocking], in doors indicated to have exit devices.
10. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.6 FABRICATION

- A. Factory fit doors to suit frame-opening sizes indicated.
 - 1. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
 - 2. Comply with NFPA 80 requirements for fire-rated doors.
- B. Factory machine doors for hardware that is not surface applied.
 - 1. Locate hardware to comply with DHI-WDHS-3.
 - 2. Comply with final hardware schedules, door frame Shop Drawings, ANSI/BHMA-156.115-W, and hardware templates.
 - 3. Coordinate with hardware mortises in metal frames, to verify dimensions and alignment before factory machining.
 - 4. For doors scheduled to receive electrified locksets, provide factory-installed raceway and wiring to accommodate specified hardware.
 - 5. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
- C. Transom and Side Panels:

1. Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
 2. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
 3. Fabricate door and transom panels with full-width, solid-lumber[, rabbeted,] meeting rails.
 4. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
- D. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
 2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
 3. Louvers: Factory install louvers in prepared openings.
- E. Exterior Doors: Factory treat exterior doors with water repellent after fabrication has been completed but before factory [priming][finishing].
1. Flash top of outswinging doors with manufacturer's standard metal flashing.

2.7 FACTORY PRIMING

- A. Doors for Opaque Finish: Factory prime faces, all four edges, edges of cutouts, and mortises with one coat of wood primer specified in [Section 099113 "Exterior Painting."][Section 099123 "Interior Painting."]

2.8 FACTORY FINISHING

- A. Comply with referenced quality standard for factory finishing.
1. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.
 2. Finish faces, all four edges, edges of cutouts, and mortises.
 3. Stains and fillers may be omitted on[top and] bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors.
- C. Factory finish doors that are indicated on Drawings to receive transparent finish.
- D. Factory finish doors where indicated in schedules or on Drawings as factory finished.
- E. Transparent Finish:
1. Architectural Woodwork Standards Grade: [Premium][Custom].
 - a. System-5, Varnish, Conversion.
 - b. System-9, UV Curable, Acrylated Epoxy, Polyester or Urethane.
 - c. System-10, UV Curable, Water Based.

- d. System-11, Polyurethane, Catalyzed.
 - 2. ANSI/WDMA I.S. 1A Grade: [Premium][Custom].
 - a. TR-4 Conversion Varnish.
 - b. TR-6 Catalyzed Polyurethane.
 - c. TR-8 UV Cured Acrylated Polyester/Urethane.
 - 3. Staining: [Match Architect's sample][As selected by Architect from manufacturer's full range][None required].
 - 4. Sheen: [Satin][Semigloss].
- F. Opaque Finish:
- 1. Architectural Woodwork Standards Grade: [Premium][Custom].
 - a. System-5, Varnish, Conversion.
 - b. System-9, UV Curable, Acrylated Epoxy, Polyester, or Urethane.
 - c. System-10, UV Curable, Water Based.
 - d. System-11, Polyurethane, Catalyzed.
 - 2. ANSI/WDMA I.S. 1A Grade: [Premium][Custom].
 - a. OP-4 Conversion Varnish.
 - b. OP-6 Catalyzed Polyurethane.
 - 3. Color: [Match Architect's sample][As selected by Architect from manufacturer's full range].
 - 4. Sheen: [Satin][Semigloss][Gloss].

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Hardware: For installation, see [Section 087100 "Door Hardware."][Section 087111 "Door Hardware (Descriptive Specification)."]
- B. Install doors[and frames] to comply with manufacturer's written instructions and

referenced quality standard, and as indicated.

C. Install frames level, plumb, true, and straight.

1. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches.
2. Anchor frames to anchors or blocking built in or directly attached to substrates.
 - a. Secure with countersunk, concealed fasteners and blind nailing.
 - b. Use fine finishing nails[or finishing screws] for exposed fastening, countersunk and filled flush with woodwork.
 - 1) For factory-finished items, use filler matching finish of items being installed.
3. Install fire-rated doors and frames in accordance with NFPA 80.
4. Install smoke- and draft-control doors in accordance with NFPA 105.

D. Job-Fitted Doors:

1. Align and fit doors in frames with uniform clearances and bevels as indicated below.
 - a. Do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors.
2. Machine doors for hardware.
3. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
4. Clearances:
 - a. Provide 1/8 inch at heads, jambs, and between pairs of doors.
 - b. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated on Drawings.
 - c. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
 - d. Comply with NFPA 80 for fire-rated doors.
5. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
6. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

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

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

3.3 FIELD QUALITY CONTROL

- A. Inspection Agency: [Owner will engage][Engage] a qualified inspector to perform inspections and to furnish reports to Architect.

B. Inspections:

1. Provide inspection of installed Work through [AWI's Quality Certification Program][WI's Certified Compliance Program], certifying that wood doors and frames, including installation, comply with requirements of AWI/AWMCA/WI's "Architectural Woodwork Standards" for the specified grade.
2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
3. Egress Door Inspections: Inspect each door equipped with panic hardware, each door equipped with fire exit hardware, each door located in an exit enclosure, each electrically controlled egress door, and each door equipped with special locking arrangements in accordance with NFPA 101, Section 7.2.1.15.

C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.

D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.

E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in [NFPA 80][and][NFPA 101].

3.4 ADJUSTING

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

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

END OF SECTION 08 14 16

SECTION 08 15 00 - INTEGRATED ACCESS CONTROL HARDWARE DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes access control door hardware for the following:
 - 1. Swinging doors.
 - 2. Other doors to the extent indicated.
- B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:
 - 1. Electrified and Integrated Access Control Card Key Door Hardware
- C. Related Sections include the following:
 - 1. Division 08 Section "Door Schedule".
 - 2. Division 08 Section "Door Hardware Schedule".
 - 3. Division 08 Section "Hollow Metal Doors and Frames."
 - 4. Division 08 Section "Flush Wood Doors".
 - 5. Division 08 Section "Integrated Door Opening Assemblies".
 - 6. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 7. Division 08 Section "All-Glass Entrances".
 - 8. Division 08 Section "Automatic Entrances".
 - 9. Division 08 Section "Door Hardware".
 - 10. Division 08 Section "Automatic Door Operators".
 - 11. Division 14 Section "Elevators" for security access to elevator floor selection controls.
 - 12. Division 26 Section "Electrical" for connections to electrical power system and for low voltage wiring work.
 - 13. Division 27 Section "Communications" for connections to the LAN.
 - 14. Division 28 Section "Access Control" for access control devices and equipment installed at door openings and provided as part of a security and site management system.
 - 15. Division 28 Section "Intrusion Detection" for detection devices installed at door openings and provided as part of an intrusion detection system.
 - 16. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
 - 17. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. References:

1. ANSI A117.1 (1998) - Accessible and Usable Buildings and Facilities.
2. IBC - International Building Code
3. NFPA 70 (2002) - National Electrical Code.
4. NFPA 80 (1999) - Fire Doors and Windows.
5. NFPA 101 (2006) - Life Safety Code.
6. UL 294 - Access Control Systems.
7. UL 1076 - Proprietary Burglar Alarm Units and Systems.

E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.

1. Security or High Security keyed cylinders, including provisions for temporary construction keying, for mechanical override at access control locking hardware to be furnished under Division 8 Section "Door Hardware".

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. System Operational Descriptions: Complete system operational narratives for the integrated access-controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.
- C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:
 1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access-controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 2. Electrical Coordination: Coordinate with related Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Proof of Certification: Upon request provide a copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include

the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum of five (5) years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.
1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.
- B. Supplier Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum of three (3) years of experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.
1. ASSA ABLOY access control products are required to be supplied only through designated "Authorized Channel Partners."
- C. System Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum of three (3) years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:
1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
 2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
 3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
 4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24-hour/7-days a week maximum response time.

- D. Installer Qualifications: Certified technicians, verifiably authorized with the primary product manufacturers for installation of IP-Enabled, Wireless, and Power-over-Ethernet Access Control products in accordance with documented instructions and NFPA 80.
 - 1. ASSA ABLOY access control products are required to be installed only through designated "Preferred Installers."
- E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
 - 1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
 - 2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1.
 - 3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
 - 4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
 - 5. The installed access control system shall conform to all local jurisdiction requirements.
- G. Keying Conference: Reference Division 8 Section "Door Hardware".
- H. Pre-Submittal Conference: Conduct conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier/Dealer, Systems Integrator, and Contractor to review proper methods and procedures for receiving, handling, and installing the access control system hardware. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedules.
 - 1. Inspect and discuss Division 26 electrical roughing-in and similar preparatory work performed by other trades.
 - 2. Review and verify sequence of operation descriptions for each unique access controlled opening.
 - 3. Review and finalize construction schedule and verify availability of materials.
 - 4. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Do not store electronic access control hardware, software or related accessories at Project site without prior authorization.

1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.
- B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.
- C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the "Pre-Submittal Conference".

1.6 COORDINATION

- A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.
- B. Access Control System Electrical Coordination: Coordinate the layout and installation of scheduled electrified door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
 1. Door Hardware Interface: The card key access control system to interface and be connected to electronic door control hardware (electromechanical locks, electric strikes, magnetic locks, door position switches, other monitoring contacts, and related auxiliary control devices) as described under Division 8 "Door Hardware". Coordinate the installation and configuration of specified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.
- C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.
- D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:
 1. Structural failures including excessive deflection, cracking, or breakage.

2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.
- C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.
- D. Special Warranty Periods (Electrified Access Control Door Hardware):
1. Two years for Electrified, Wiegand Output, and IP-Enabled Access Control Door Hardware.
- E. Maintenance Support and Extended Service Agreement: Submit for Owner's consideration an optional extended Service Agreement for the installed access control system, including support for software related issues. The extended Service Agreement is considered elective and is without manufacturer's requirement stipulating mandatory coverage for owner and/or vendor system support.
1. A published copy of this agreement to be included with the submittal package
 2. Support for the installed access control system components is provided through the vendor under a 24 hour technical assistance program.
 3. Access control and management system components are to be available on a one-day turn around time frame from the manufacturer.
 4. Primary systems manufacturer to offer and provide remote modem or internet access for direct factory support to the vendor. The factory level support to include diagnostics and troubleshooting support on systems related issues at no additional cost to the owner.
- F. Access Control Software Upgrades: Version upgrades and "fix" releases to the access control system software are available at no extra charge as long as the version of software provided under this specification remains the current manufacturer's version or for up to (2) years after a new version release.
1. Major access control software revisions that provide new functionality to the product provided free of charge for up to one (1) year from the date of substantial completion.
 2. Access control system software is to be upgradable as may be required or as necessary, to expand and manage the owner's site or sites. Upgrades are to be offered at a published flat fee for the primary system software, with single license modules included in the primary fee structure. System upgrades offered at a costing structure based upon the original number of licensed modules issued, or on those to be purchased at a future date, are not allowed.
 3. As part of the submittal package, provide a list of available software upgrades and/or expansions modules. List to identify related costs for upgrades, or expansions to the original system, up to the next qualifying operational level.

1.8 MAINTENANCE SERVICE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of the installed access control system hardware and components.
- B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance by skilled employees of the Systems Integrator. Include repair or replacement of worn or defective components,

lubrication, cleaning, and adjusting as required for proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

- A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
 - 1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 POWER OVER ETHERNET ACCESS CONTROL

- A. IP Enabled Power-over-Ethernet (PoE) Integrated Card Reader Mortise Lock: IP enabled ANSI/BHMA A156.13 Grade 1 mortise lockset with integrated credential reader, request-to-exit, and door position signaling in one complete unit. Motor driven locking/unlocking control of the lever handle trim, 3/4" projection latchbolt, and optional 1" steel deadbolt. Lock is U.L listed and labeled for use on up to 3 hour fire rated openings. Available with or without keyed high security cylinder override.
 - 1. Completely intelligent and integrated locking unit with Ethernet power and communication connection capability directly from the locking unit back to the central system host server without additional access control interfaces or components (excluding PoE Endspan and Midspan devices) via an existing or newly installed IEEE 802.3af PoE enabled network.
 - 2. Open architecture design supports wired integration with third party access control systems applications via software development kit (SDK). Real-time software accessible alarms for forced door, unknown card and door held open, with inside lever handle (request-to-exit), battery status, tampering, and door position (open/closed status) monitoring.
 - 3. 2,400 users and 10,000 event transaction history (audit trail). Distributed intelligence allows stand alone operation in absence of network communication allowing for system operational redundancy.
 - 4. Provide a network and lock configuration CD tool kit for initial lock setup and programming via a USB connection.
 - 5. Energy Efficient Design: Provide lock bodies which have a holding current draw of 15mA maximum, and can operate on either 12 or 24 volts. Locks are to be field configurable for fail safe or fail secure operation.
 - 6. Integrated reader supports the following credentials:

- a. 125kHz proximity credentials: HID, AWID, Indala, and EM4102.
 - b. 13.56 MHz contactless credentials: HID iClass, HID iClass SE, HID iClass Seos, SIO on MIFARE Classic, SIO on MIFARE DESFire EV1, MIFARE Classic, DESfire EV1, NFC-enabled mobile phones, Bluetooth Smart-enabled mobile phones.
- 7. Optional push-button keypad for PIN only usage or dual authentication requirements.
 - 8. Communication between access control system and device is protected by AES 128 bit encryption via the SDK. Programmable for time zones, holidays, and automatic unlocking.
 - 9. Power and communication from one Ethernet (CAT5e or higher) cable. Compliant with 802.3af Class 1 device specifications requiring 3.84 watts for Power over Ethernet.
 - 10. Supports real-time system lockdown capabilities. Inside lever retracts latch bolt and deadbolt simultaneously.
 - 11. High security mechanical key provides emergency override retraction of latchbolt without need for electronic activation.
 - 12. Ethernet system framework, network cabling, mounting boxes, PoE end-span/mid-span, electrical hard wiring, grounding, and connections are required for complete system functionality. All system components are by others and are specified elsewhere.
 - a. Power Requirement: PoE Class 2, maximum 7 watts.
 - b. Network Cabling Requirements: Cat5e or higher meeting or exceeding ANSI/TIA/EIA-568-C. 24 AWG Plenum rated.
 - c. Bonding and Grounding: Meet or exceed TIA-607-B requirements. Connect device ground cable to building electrical earth ground.
 - d. Network Surface Mount Box: Meet or exceed ANSI/TIA/EIA-568-C requirements. Cat5e or higher (RJ45).
 - 13. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - IN220 Series.
 - b. Sargent Manufacturing (SA) - IN220 Series.

2.3 POWER SUPPLIES

2.4 CABLES AND WIRING

- A. Comply with Division 27 Section "Conductors and Cables for Electronic Safety and Security."
- B. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.
- C. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.5 ACCESS CONTROL HARDWARE FINISHES

- A. Standard: Comply with BHMA A156.18.

- B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.
- C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.
- D. BHMA Designations: Comply with base material and finish as specified.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.
- B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.
- C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.
- D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

- A. Install each item of electronic integrated door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
- B. Mounting Heights: Mount electronic integrated door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

- C. Boxed Power Supplies: Verify locations.
 - 1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.
- D. Final connect the system control switches (integrated card key locking hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.
- E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- F. System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.
- B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.
 - 1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.
 - 2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
 - 3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
 - 4. Provide "as designed" drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
 - 5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

- A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by access control system installation.
- B. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Engage an authorized systems manufacturer representative to train Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL HARDWARE SETS

- A. The access control system hardware sets listed below represent the design intent and direction of the owner, architect, and security consultant (as applicable). They are intended as a guideline only and should not be considered a detailed opening schedule. Discrepancies, conflicting, and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
- B. The supplier is responsible for handing and sizing all products and providing the correct option for the appropriate door type and material where more than one is presented in the hardware sets. Quantities listed are for each pair of doors, or for each single door.
- C. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 08 15 00

SECTION 08 33 23 - OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Service doors.
2. Insulated service doors.
3. Fire-rated service doors.
4. Fire-rated, insulated service doors.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, door-opening framing, corner guards, and bollards.
2. [Section 099113 "Exterior Painting"] and [Section 099123 "Interior Painting"] for finish painting of factory-primed doors.
3. Section 111200 "Parking Control Equipment" for parking control equipment interlocked to overhead coiling doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
3. Include description of automatic-closing device and testing and resetting instructions.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Show locations of controls, locking devices[, detectors or replaceable fusible links], and other accessories.
6. Include diagrams for power, signal, and control wiring.

- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
 - 1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
 - 1. Curtain slats[, including full vision window secured to slat].
 - 2. Bottom bar[with sensor edge].
 - 3. Guides.
 - 4. Brackets.
 - 5. Hood.
 - 6. Locking device(s).
 - 7. Include similar Samples of accessories involving color selection.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][and][testing and inspecting agency].
 - 1. Fire-Rated Door Inspector: Submit documentation of compliance with NFPA 80, Section 5.2.3.1.
 - 2. Submit copy of DHI Fire and Egress Door Assembly Inspector (FDAI) certificate.
- B. Oversize Construction Certification: For door assemblies required to be fire-rated and that exceed size limitations of labeled assemblies.
- C. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Special warranty.
- B. Maintenance Data: For overhead coiling doors to include in maintenance manuals.
- C. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
 - 1. Maintenance Proximity: Not more than [two]<Insert number> hours' normal travel time from Installer's place of business to Project site.
- B. Fire-Rated Door Inspector Qualifications: Inspector for field quality control inspections of fire-rated door assemblies is to meet the qualifications set forth in NFPA 80, Section

5.2.3.1 and the following:

1. Door and Hardware Institute Fire and Egress Door Assembly Inspector (FDAl) certification.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of doors that fail in materials or workmanship within specified warranty period.

1. Warranty Period: [Two]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain overhead coiling doors from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling-door manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Door Assemblies: Complying with NFPA 80; listed and labeled by qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to [NFPA 252][or][UL 10B].
 1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.
 2. Temperature-Rise Limit: [Where indicated][At exit enclosures and exit passageways], provide doors that have a maximum transmitted temperature end point of not more than 450 deg F above ambient after 30 minutes of standard fire-test exposure.
 3. Smoke Control: [Where indicated][In corridors and smoke barriers], provide doors that are listed and labeled with the letter "S" on the fire-rating label by a qualified testing agency for smoke- and draft-control based on testing according to UL 1784; with maximum air-leakage rate of 3.0 cfm/sq. ft. of door opening at 0.10 inch wg for both ambient and elevated temperature tests.
- B. Sound-Control Doors: Assemblies tested in a laboratory for sound-transmission-loss performance according to ASTM E90, calculated according to ASTM E413, and rated for not less than the STC value indicated.
- C. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1]<Insert requirement>.

- D. Structural Performance, Exterior Doors: Capable of withstanding the following design wind loads:
1. Design Wind Load: [As indicated on Drawings][Uniform pressure (velocity pressure) of 20 lbf/sq. ft., acting inward and outward]<Insert loads>.
 2. Testing: According to ASTM E330/E330M[or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108]<Insert requirement>.
 3. Deflection Limits: Design overhead coiling doors to withstand design wind load without evidencing permanent deformation or disengagement of door components.
 4. Operability under Wind Load: Design overhead coiling doors to remain operable under [design][uniform pressure (velocity pressure) of 20-lbf/sq. ft.]<Insert load> wind load, acting inward and outward.
- E. Windborne-Debris Impact Resistance: Provide [glazed][and][impact-protective] overhead coiling doors that pass ASTM E1886 missile-impact and cyclic-pressure tests according to [ASTM E1996 for Wind Zone 1][ASTM E1996 for Wind Zone 2][ASTM E1996 for Wind Zone 3][ASTM E1996 for Wind Zone 4][or DASMA 115] for [basic][enhanced] protection.
1. Large-Missile Test: For overhead coiling doors located within [30 ft.]<Insert dimension> of grade.
 2. Small-Missile Test: For overhead coiling doors located between 30 ft. and [60 ft.]<Insert dimension> above grade.
- F. Seismic Performance: Overhead coiling doors are to withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.
1. Component Importance Factor: [1.5][1.0].

2.3 DOOR ASSEMBLY

- A. Overhead Coiling Door: [Service][Insulated service] overhead coiling door formed with curtain of interlocking metal slats.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ACME Rolling Doors]
 - b. [Advanced Door Technologies]
 - c. [Alpine Overhead Doors, Inc]
 - d. [Alumatec Pacific Products]
 - e. [Amarr Company]
 - f. [ASTA America; Janus International Group]
 - g. [C.H.I. Overhead Doors, Inc.]
 - h. [City Gates USA]
 - i. [Clipay Building Products]
 - j. [Cookson; a CornellCookson company]

- k. [Cornell; a CornellCookson company]
 - l. [Dynamic Closures Corporation]
 - m. [Hormann High Performance Doors]
 - n. [Lawrence Roll-Up Doors, Inc.]
 - o. [McKeon Door Company]
 - p. [Metro Door LLC]
 - q. [Overhead Door Corporation]
 - r. [Raynor Garage Doors]
 - s. [Southwestern Rolling Steel Door Co]
 - t. [Wayne Dalton; a division of Overhead Door Corporation]
 - u. [Windsor Door]
 - v. <Insert manufacturer's name>
- B. Operation Cycles: Door components and operators capable of operating for not less than [10,000][20,000][50,000][100,000][200,000]<Insert number> cycles. One operation cycle is complete when a door is opened from the closed position to the fully open position and returned to the closed position.
- 1. Include tamperproof cycle counter.
- C. Air Infiltration: Maximum rate of [0.4 cfm/sq. ft.][1.0 cfm/sq. ft.]<Insert rate> at 15 and 25 mph when tested according to [ASTM E283][or][DASMA 105].
- D. STC Rating: [26]<Insert value>.
- E. Insulated Door Curtain R-Value: [4.5 deg F x h x sq. ft./Btu]<Insert value>.
- F. Insulated Door Assembly U-Factor: [0.90 Btu/deg F x h x sq. ft.]<Insert value>.
- G. Door Curtain Material: [Galvanized steel][Stainless steel][Aluminum].
- H. Door Curtain Slats: [Curved][Flat] profile slats of [1-7/8-inch][2-5/8-inch][3-1/4-inch]<Insert dimension> center-to-center height.
- 1. Perforated Slats: Approximately [1/16-inch pinholes][3/32-inch pinholes][7/8-inch- wide by 3/8-inch- high slots]<Insert dimensions>.
 - 2. Fenestrated Slats: Approximately [3- by 5/8-inch][4- by 5/8-inch][10- by 1-5/8-inch]<Insert dimensions> openings spaced approximately [1-1/2 inches]<Insert dimension> apart and beginning 12 inches from jamb guides.
 - 3. Vision Panels: Approximately 10- by 1-5/8-inch openings spaced approximately 2 inches apart and beginning 12 inches from end guides; in [two][three]<Insert number> rows of slats at height indicated on Drawings; installed with[insulated] vision-panel glazing.
 - 4. Insulated-Slat Interior Facing: [Metal][Plastic].
 - 5. Gasket Seal. Manufacturer's standard continuous gaskets between slats.
- I. Bottom Bar: Two angles, each not less than [1-1/2 by 1-1/2 by 1/8 inch thick]<Insert dimensions>; fabricated from [hot-dip galvanized steel][stainless steel][or][aluminum extrusions] and finished [to match door]<Insert requirement>.
- J. Curtain Jamb Guides: [Galvanized steel][Stainless steel][Aluminum] with exposed

finish matching curtain slats.

- K. Pass Door(s): [Hinged][Rigid] frame with [lockset][exit hardware].
- L. Hood: [Match curtain material and finish][Galvanized steel][Stainless steel][Aluminum].
1. Shape: [Round][Square][As indicated on Drawings]<Insert shape>.
 2. Mounting: [Face of wall][Between jambs][As indicated on Drawings].
- M. Locking Devices: Equip door with [slide bolt for padlock][locking device assembly][and][chain lock keeper].
1. Locking Device Assembly: [Single-jamb side][Cremone-type, both jamb sides] locking bars, operable from [inside with thumbturn][outside with cylinder][outside only, with cylinder][inside and outside with cylinders]<Insert requirement>.
- N. Manual Door Operator: [Push-up operation][Chain-hoist operator][Manufacturer's standard crank operator][Awning-crank operator][Wall-crank operator].
1. Provide operator with through-wall shaft operation.
 2. Provide operator with manufacturer's standard removable operating arm.
- O. Electric Door Operator:
1. Usage Classification: [Heavy duty, 25 or more cycles per hour and more than 90 cycles per day][Standard duty, up to 25 cycles per hour and up to 90 cycles per day][Medium duty, up to 12 cycles per hour and up to 50 cycles per day][Light duty, up to 10 cycles per hour]<Insert classification>.
 2. Operator Location: [Top of hood][Front of hood][Wall][Bench][Through wall][As indicated on Drawings].
 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use[; moving parts of operator enclosed or guarded if exposed and mounted at 8 ft. or lower].
 4. Motor Exposure: [Interior][Exterior, wet, and humid].
 5. Motor Electrical Characteristics:
 - a. Horsepower: [1/2][1][2][3]<Insert value> hp.
 - b. Voltage: [115 V ac, single phase, 60 Hz][208 V ac, single phase, 60 Hz][230 V ac, single phase, 60 Hz][208 V ac, three phase, 60 Hz][230 V ac, three phase, 60 Hz][460 V ac, three phase, 60 Hz].
 6. Emergency Manual Operation: [Push-up][Chain][Crank] type.
 7. Obstruction-Detection Device: Automatic [photoelectric sensor][electric sensor edge on bottom bar][pneumatic sensor edge on bottom bar][; self-monitoring type]<Insert type>.
 - a. Sensor Edge Bulb Color: [Black][As selected by Architect from manufacturer's full range]<Insert color>.
 8. Control Station(s): [Interior mounted][Exterior mounted][Where indicated on Drawings]<Insert location>.

- 9. Other Equipment: [Audible and visual signals][Portable radio-control system]<Insert device>.
- P. Curtain Accessories: Equip door with [smoke seals][weatherseals][astragal][push/pull handles][pull-down strap][pole hook][and][automatic-closing device]<Insert item>.
- Q. Door Finish:
 - 1. Aluminum Finish: [Mill][Clear anodized][Light bronze anodized][Medium bronze anodized][Dark bronze anodized][Black anodized][Anodized color matching Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert color>.
 - 2. Baked-Enamel or Powder-Coated Finish: [Color as indicated by manufacturer's designations][Color matching Architect's sample][Color as selected by Architect from manufacturer's full range]<Insert color>.
 - 3. Factory Prime Finish: Manufacturer's standard color.
 - 4. Stainless Steel Finish: [ASTM A480/A480M No. 2B (bright, cold rolled)][ASTM A480/A480M No. 4 (polished directional satin)]<Insert finish>.
 - 5. Interior Curtain-Slat Facing: [Match finish of exterior curtain-slat face][Finish as indicated by manufacturer's designations][Finish matching Architect's sample][Finish as selected by Architect from manufacturer's full range]<Insert finish>.

2.4 MATERIALS, GENERAL

- 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.

2.5 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
 - 1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural-steel sheet; complying with ASTM A653/A653M, with G90 zinc coating; nominal sheet thickness (coated) of 0.028 inch; and as required.
 - 2. Stainless Steel Door Curtain Slats: ASTM A240/A240M or ASTM A666, Type 304; sheet thickness of 0.025 inch; and as required.
 - 3. Aluminum Door Curtain Slats: ASTM B209 sheet or ASTM B221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch; and as required.
 - 4. Vision-Panel Glazing: Manufacturer's standard clear glazing, fabricated from transparent acrylic sheet or fire-protection-rated glass as required for type of door; set in glazing channel secured to curtain slats.
 - 5. Insulation: Fill slats for insulated doors with manufacturer's standard thermal

- insulation complying with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84 or UL 723. Enclose insulation completely within slat faces.
6. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face, with [minimum steel thickness of 0.010 inch][and][minimum aluminum thickness of 0.032 inch].
 7. Plastic Interior Curtain-Slat Facing: Extruded PVC plastic with maximum flame-spread index of [25][75][200] and smoke-developed index of 450, according to ASTM E84 or UL 723.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain[, and a continuous bar for holding windlocks].
- C. Pass Door(s): Swinging-door and frame assembly constructed integrally with the coiling-door assembly[and bearing the same fire rating]. Comply with the accessibility standard of authorities having jurisdiction.
1. Door Frame and Integral Jamb Guide: Fabricate of angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading.
 2. Hinged Frame: Hinged pass door and frame that swings out of the way, as a unit, to allow use of the full coiling-door opening width. One jamb of the pass-door frame is hinged and the other jamb includes a guide for the lower, narrower part of the coiling-door curtain.
 3. Rigid Frame: Rigid pass door and frame that are built into the rigid, lower part of the door curtain and that raise with the curtain.
 4. Locking Hardware:
 - a. [Lockset][Exit Hardware]: [As specified in Section 087100 "Door Hardware."][As specified in Section 087111 "Door Hardware (Descriptive Specification)."]¹[As selected by Architect from manufacturer's full range.]<Insert requirement.>
 - b. Lock Cylinders: As [specified in Section 087100 "Door Hardware"]²[specified in Section 087111 "Door Hardware (Descriptive Specification)"]³[standard with manufacturer][and keyed to building keying system].
 - c. Keys: [Two][Three]<Insert number> for each cylinder.
 5. Thresholds: Equip pass doors with integral thresholds that comply with the accessibility standard of authorities having jurisdiction.

2.6 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects

beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.

1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
 2. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A240/A240M or ASTM A666.
 3. Aluminum: 0.040-inch- thick aluminum sheet complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and finish indicated.
 4. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.
 5. Exterior-Mounted Doors: Fabricate hood to act as weather protection and with a perimeter sealant-joint-bead profile for applying joint sealant.
- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.

2.7 LOCKING DEVICES

- A. 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.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
1. Lock Cylinders: As [specified in Section 087100 "Door Hardware"] [specified in Section 087111 "Door Hardware (Descriptive Specification)"] [standard with manufacturer] [and keyed to building keying system].
 2. Keys: [Two] [Three] <Insert number> 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.

2.8 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Weatherseals for Exterior Doors: Equip each exterior door with weather-stripping gaskets fitted to entire exterior perimeter of door for a weather-resistant installation unless otherwise indicated.
1. At door head, use 1/8-inch- thick, replaceable, continuous-sheet baffle secured to inside of hood or field-installed on the header.

2. At door jambs, use replaceable, adjustable, continuous, [flexible, 1/8-inch- thick seals of flexible vinyl, rubber, or neoprene][nylon brushes]<Insert material>.
- C. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
- D. Push/Pull Handles: Equip each push-up-operated or emergency-operated door with lifting handles on each side of door, finished to match door.
- E. Pull-Down Strap: Provide pull-down straps for doors more than 84 inches high.
- F. Pole Hooks: Provide pole hooks and poles for doors more than 84 inches high.
- G. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism.[Testing for manually operated doors allows resetting by opening the door without retensioning the counterbalance mechanism][Release mechanism for motor-operated doors allows testing without mechanical release of the door.] Automatic-closing device is to be designed for activation by the following:
 1. Replaceable fusible links with temperature rise and melting point of [165 deg F]<Insert temperature> interconnected and mounted on both sides of door opening.
 2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
 3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
 4. Building fire-detection, smoke-detection, and -alarm systems.

2.9 COUNTERBALANCE MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, [seamless][or][welded] carbon-steel pipe, 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. of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
 1. Fire-Rated Doors: Equip with auxiliary counterbalance spring and prevent tension release from main counterbalance spring when automatic-closing device

operates.

- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.10 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Push-up Door Operation: Lift handles and pull rope for raising and lowering doors, with counterbalance mechanism designed so that required lift or pull for door operation does not exceed [25 lbf]<Insert value>.
- C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum [25-lbf][30-lbf]<Insert value> force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.
- D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than [25-lbf][30-lbf]<Insert value> force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.11 ELECTRIC DOOR OPERATORS

- A. General: Electric door operator assembly of size and capacity recommended and provided by door manufacturer for door and operation-cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking door, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. 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 Location(s): Operator location indicated for each door.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on top of the door-hood assembly and connected to the door drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left door head plate with the operator on coil side of the door-hood assembly and connected to the

- door drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of door and connected to door drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
 4. Bench Mounted: Operator is mounted to the right or left door head plate and connected to the door drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
 5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of door.
- D. Motors: Reversible-type motor[with controller (disconnect switch)] for motor exposure indicated for each door assembly.
1. Electrical Characteristics: Minimum as indicated for each door assembly. 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. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers, Disconnect Switches, Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized door with adjustable switches interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of door opening.[For non-fire-rated doors, activation of device immediately stops and reverses downward door travel.][For fire-rated doors, activation delays closing.]
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in door opening without contact between door and obstruction.
 - a. Self-Monitoring Type: Designed to interface with door operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, door closes only with sustained or constant pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with door operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type, NEMA ICS 6, Type 4 enclosure, key operated.
- H. 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][30 lbf]<Insert value>.
- I. 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.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.
- L. Portable Radio-Control System: Consisting of [one][two]<Insert number> of the following per door operator:
1. Three-channel universal coaxial receiver to open, close, and stop door.
 2. Portable control device to open and stop door may be momentary-contact type; control to close door is to be sustained- or constant-pressure type.
 3. Remote-antenna mounting kit.

2.12 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining 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. Mill Finish: Manufacturer's standard.
- B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
- C. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
- D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.14 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.15 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: ASTM A480/A480M No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: ASTM A480/A480M No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.

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

3.2 INSTALLATION, GENERAL

- A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling doors, hoods, controls, and operators at the mounting locations indicated for each door.
- C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Fire-Rated Doors: Install according to NFPA 80.
- E. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.
- F. Power-Operated Doors: Install[automatic garage doors openers] according to UL 325.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage][Engage] a qualified testing agency to perform tests and inspections and to furnish reports to Architect.
- B. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:
 - 1. Test door release, closing, and alarm operations when activated by smoke detector or building's fire-alarm system. Test manual operation of closed door. Reset door-closing mechanism after successful test.
 - 2. Fire-Rated Door Inspections: Inspect each fire-rated door in accordance with NFPA 80, Section 5.2.
- C. Repair or remove and replace installations where inspections indicate that they do not comply with specified requirements.
- D. Reinspect repaired or replaced installations to determine if replaced or repaired door assembly installations comply with specified requirements.
- E. Prepare and submit separate inspection report for each fire-rated door assembly indicating compliance with each item listed in [NFPA 80][and][NFPA 101].

3.4 STARTUP SERVICE

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

2. After electrical circuitry has been energized, operate doors to confirm proper motor rotation and door performance.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

3.5 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.
 1. Adjust exterior doors and components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.
- C. Adjust seals to provide tight fit around entire perimeter.

3.6 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service includes [three][six][nine][12] months' full maintenance by skilled employees of coiling-door Installer. Include [monthly][quarterly] preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
 1. Perform maintenance, including emergency callback service, during normal working hours.
 2. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.7 DEMONSTRATION

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

END OF SECTION 08 33 23

SECTION 08 33 26 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-curtain overhead coiling grilles.
2. Closed-curtain overhead coiling grilles.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for miscellaneous steel supports, angle-framing of grille opening, corner guards, and bollards.
2. [Section 099113 "Exterior Painting"] [and] [Section 099123 "Interior Painting"] for finish painting of factory-primed grilles.
3. Section 111200 "Parking Control Equipment" for parking control equipment interlocked to overhead coiling grilles.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling grille and accessory.

1. Include construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished accessories.

B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.

1. Include plans, elevations, sections, and mounting details.
2. Include details of equipment assemblies. Indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction.
5. Show locations of controls, locking devices, and other accessories.
6. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.

- D. Samples for Verification: For each type of exposed finish on the following components, in manufacturer's standard sizes:
1. Open-curtain grille with full-size components consisting of rods, spacers, and links as required to illustrate each assembly[, including glazed inserts].
 2. Closed-curtain grille with full-size components consisting of ribs and infill as required to illustrate each assembly.
 3. Bottom bar[with sensor edge].
 4. Guides.
 5. Mounting frame.
 6. Brackets.
 7. Hood.

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of grilles that fail in materials or workmanship within specified warranty period.
1. Warranty Period: [Two] <Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain overhead coiling grilles from single source from single manufacturer.

1. Obtain operators and controls from overhead coiling-grille manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Overhead coiling grilles withstand the effects of earthquake motions determined according to [ASCE/SEI 7]<Insert requirement>.

1. Component Importance Factor: [1.5][1.0].

2.3 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Open-Curtain Grille: Overhead coiling[, countertop] grille with a curtain having a network of horizontal rods that interconnect with vertical links.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ACME Rolling Doors]
- b. [Advanced Door Technologies]
- c. [Alpine Overhead Doors, Inc]
- d. [Alumatec Pacific Products]
- e. [Amarr Company]
- f. [C.H.I. Overhead Doors, Inc.]
- g. [City Gates USA]
- h. [Clipay Building Products]
- i. [Cookson; a CornellCookson company]
- j. [Cornell; a CornellCookson company]
- k. [Dynaflair Corporation]
- l. [Dynamic Closures Corporation]
- m. [Lawrence Roll-Up Doors, Inc.]
- n. [McKeon Door Company]
- o. [Metro Door LLC]
- p. [Overhead Door Corporation]
- q. <Insert manufacturer's name>

- B. Operation Cycles: Grille components and operators capable of operating for not less than [10,000][20,000][50,000][100,000][200,000]<Insert number>. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1. Include tamperproof cycle counter.

- C. Grille Curtain Material: [Aluminum][Stainless steel][Galvanized steel].

1. Rod Spacing: Approximately [1-1/2 inches][2 inches][3 inches]<Insert dimension> o.c.
2. Link Spacing: Approximately [3 inches][6 inches][9 inches]<Insert dimension>

- apart in a [straight in-line][brick (staggered)]<Insert pattern> pattern.
 - 3. Glazing Inserts: [Manufacturer's standard]<Insert description>.
 - 4. Spacers: [Metal tubes matching curtain material][PVC]<Insert description>.
- D. Bottom Bar: Continuous [tubular shape][channel][or][doubled angles], fabricated from [aluminum extrusion][hot-dip galvanized steel][or][stainless steel] and finished [to match grille]<Insert requirement>.
- E. Curtain Jamb Guides: [Aluminum][Stainless steel][Galvanized steel] with exposed finish [matching curtain slats]<Insert requirement>. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.[Provide removable post(s) and jamb guides where indicated on Drawings.]
- F. Hood: [Match curtain material and finish][Aluminum][Stainless steel][Galvanized steel].
 - 1. Shape: [Round][Square][As indicated on Drawings]<Insert shape>.
 - 2. Mounting: [Face of wall][Between jambs][On mounting frame][As indicated on Drawings].
- G. Locking Devices: Equip grille with [slide bolt for padlock][locking device assembly][and][chain lock keeper].
 - 1. Locking Device Assembly: [Single-jamb side][Cremone-type, both jamb sides] locking bars, operable from [inside with thumbturn][outside with cylinder][outside only, with cylinder][inside and outside with cylinders]<Insert requirement>.
- H. Manual Grille Operator: [Push-up operation][Chain-hoist operator][Manufacturer's standard crank operator][Awning-crank operator][Wall-crank operator].
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
- I. Electric Grille Operator:
 - 1. Usage Classification: [Heavy duty, 25 or more cycles per hour and more than 90 cycles per day][Standard duty, up to 25 cycles per hour and up to 90 cycles per day][Medium duty, up to 12 cycles per hour and up to 50 cycles per day][Light duty, up to 10 cycles per hour]<Insert classification>.
 - 2. Operator Location: [Top of hood][Front of hood][Wall][Bench][Through wall][As indicated on Drawings].
 - 3. Safety: Listed according to UL 325 by a qualified testing agency for commercial or industrial use[; moving parts of operator enclosed or guarded if exposed and mounted at 8 feet or lower].
 - 4. Motor Exposure: [Interior][Exterior, wet, and humid].
 - 5. Motor Electrical Characteristics:
 - a. Horsepower: [1/2][1][2][3]<Insert value> hp.
 - b. Voltage, Single Phase, 60 Hz: [115-V ac][208-V ac][230-V ac].
 - c. Voltage, Three Phase, 60 Hz: [208-V ac][230-V ac][460-V ac].
 - 6. Emergency Manual Operation: [Push-up][Chain][Crank] type.

7. Obstruction-Detection Device: Automatic [photoelectric sensor][electric sensor edge on bottom bar][pneumatic sensor edge on bottom bar][; self-monitoring type]<Insert type>.
 - a. Sensor Edge Bulb Color: [Black][As selected by Architect from manufacturer's full range]<Insert color>.
 8. Control Station: [Interior mounted][Exterior mounted][Where indicated on Drawings]<Insert location>.
 9. Other Equipment: [Audible and visual signals][Emergency-egress release][Self-opening mechanism]<Insert device>.
- J. Curtain Accessories: Equip grille with [astragal][push/pull handles][and][pole hook]<Insert item>.
- K. Grille Finish:
1. Aluminum Finish: [Mill][Clear anodized][Light bronze anodized][Medium bronze anodized][Dark bronze anodized][Black anodized][Anodized color matching Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert color>.
 2. Baked-Enamel or Powder-Coat Finish: [Color as indicated by manufacturer's designations][Color matching Architect's sample][Color as selected by Architect from manufacturer's full range]<Insert color and gloss>.
 3. Factory Prime Finish: Manufacturer's standard color.
 4. Stainless Steel Finish: [No. 2B (bright, cold rolled)][No. 4 (polished directional satin)]<Insert finish>.
 5. PVC Spacers: [Color as indicated by manufacturer's designations][Color as selected by Architect from manufacturer's full range]<Insert color>.

2.4 MATERIALS, GENERAL

- 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.

2.5 GRILLE CURTAIN MATERIALS AND CONSTRUCTION

- A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.
1. Aluminum Grille Curtain: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
 2. Stainless Steel Grille Curtain: ASTM A666 or ASTM A240/A240M, Type 300 series.
 3. Steel Grille Curtain: Hot-dip zinc coated (galvanized) complying with ASTM A123/A123M, or electrogalvanized complying with ASTM 653/A653M, and phosphatized before fabrication.

4. Glazing Insert: Manufacturer's standard glazing of clear polycarbonate sheet secured by the curtain links.
- B. Closed-Curtain Grilles: Fabricate curtain as a series of horizontal double-C ribs, spaced at regular intervals, that alternate with continuous horizontal infill panels secured by the ribs.
1. Aluminum Horizontal Ribs: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
 2. Glass Panels: Uncoated, clear, heat-treated, fully tempered float glass; complying with ASTM C1048, Condition A, Type I, Class I, Quality q3, Kind FT; manufacturer's standard panel dimensions and thickness.
 3. Plastic Panels: Fire-retardant polycarbonate sheet manufactured by the extrusion process; UV resistant; manufacturer's standard panel dimensions and thickness.
 4. Aluminum Panels: ASTM B209, alloy and temper standard with manufacturer for type of use and finish indicated; manufacturer's standard panel dimensions and thickness; finished to match ribs.
 - a. Perforations: [Manufacturer's standard pinholes]<Insert description>.
- C. Bottom Bar: Manufacturer's standard continuous shape unless otherwise indicated, finished to match grille.
1. Astragal: Equip grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
 2. Provide motor-operated grilles with combination bottom astragal and sensor edge.
- D. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.
1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.6 HOODS AND ACCESSORIES

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
1. Galvanized Steel: Nominal 0.028-inch- thick, hot-dip galvanized-steel sheet with G90 zinc coating, complying with ASTM A653/A653M.
 2. Stainless Steel: 0.025-inch- thick, stainless steel sheet, Type 304, complying with ASTM A666 or ASTM A240/A240M.
 3. Aluminum: 0.040-inch- thick aluminum sheet, complying with ASTM B209, of alloy and temper recommended by manufacturer and finisher for type of use and

finish indicated.

- B. Removable Metal Soffit: Formed or extruded from same metal and with same finish as curtain if hood is mounted above ceiling unless otherwise indicated.
- C. Mounting Frame: Manufacturer's standard mounting frame designed to support grille; factory fabricated from ASTM A36/A36M structural-steel [tubes][or][shapes], hot-dip galvanized per ASTM A123/A123M; fastened to floor and structure above grille; to be built into wall construction; and complete with anchors, connections, and fasteners.
- D. Push/Pull Handles: Equip push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.
- E. Pull-Down Strap: Provide pull-down straps for grilles more than 84 inches high.
- F. Pole Hooks: Provide pole hooks and poles for grilles more than 84 inches high.

2.7 LOCKING DEVICES

- A. 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.
- B. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.
 - 1. Lock Cylinders: As [specified in Section 087100 "Door Hardware"] [specified in Section 087111 "Door Hardware (Descriptive Specification)"] [standard with manufacturer] [and keyed to building keying system].
 - 2. Keys: [Two][Three]<Insert number> for each cylinder.
- C. Chain Lock Keeper: Suitable for padlock.
- D. Safety Interlock Switch: Equip power-operated grilles with safety interlock switch to disengage power supply when grille is locked.

2.8 COUNTERBALANCE MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, [seamless][or][welded] carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of parts and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.
- C. Counterbalance Spring: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment

accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

- D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.
- E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.9 MANUAL GRILLE OPERATORS

- A. General: Equip grille with manual grille operator by grille manufacturer.
- B. Push-up Grille Operation: Lift handles and pull rope for raising and lowering grille, with counterbalance mechanism designed so that required lift or pull for grille operation does not exceed [25 lbf]<Insert value>.
- C. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum [25-lbf][30-lbf]<Insert value> force for grille operation. Provide alloy-steel hand chain with chain holder secured to operator guide.
- D. Crank Operator: Consisting of crank and crank gearbox, steel crank drive shaft, and gear-reduction unit, of type indicated. Size gears to require not more than [25-lbf][30-lbf]<Insert value> force to turn crank. Fabricate gearbox to be oiltight and to completely enclose operating mechanism. Provide manufacturer's standard crank-locking device.

2.10 ELECTRIC GRILLE OPERATORS

- A. General: Electric grille operator assembly of size and capacity recommended and provided by grille manufacturer for grille and operation cycles requirement specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, control stations, control devices, integral gearing for locking grille, and accessories required for proper operation.
 - 1. Comply with NFPA 70.
 - 2. 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 grille.
- C. Grille Operator Location(s): Operator location indicated for each grille.
 - 1. Top-of-Hood Mounted: Operator is mounted to the right or left grille head plate, with the operator on top of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Headroom is required for this type of mounting.
 - 2. Front-of-Hood Mounted: Operator is mounted to the right or left grille head plate,

- with the operator on coil side of the grille-hood assembly and connected to the grille drive shaft with drive chain and sprockets. Front clearance is required for this type of mounting.
3. Wall Mounted: Operator is mounted to the inside front wall on the left or right side of grille and connected to grille drive shaft with drive chain and sprockets. Side room is required for this type of mounting. Wall-mounted operator can also be mounted above or below shaft; if above shaft, headroom is required.
 4. Bench Mounted: Operator is mounted to the right or left grille head plate and connected to the grille drive shaft with drive chain and sprockets. Side room is required for this type of mounting.
 5. Through-Wall Mounted: Operator is mounted on other side of wall from coil side of grille.
- D. Motors: Reversible-type motor[with controller (disconnect switch)] for motor exposure indicated for each grille assembly.
1. Electrical Characteristics: Minimum as indicated for each grille assembly. If not indicated, large enough to start, accelerate, and operate grille in either direction from any position, at a speed not less than 8 in./sec. and not more than 12 in./sec., without exceeding nameplate ratings or service factor.
 2. Operating Controls, Controllers (Disconnect Switches), Wiring Devices, and Wiring: Manufacturer's standard unless otherwise indicated.
 3. Coordinate wiring requirements and electrical characteristics of motors and other electrical devices with building electrical system and each location where installed.
- E. Limit Switches: Equip each motorized grille with adjustable switches interlocked with motor controls and set to automatically stop grille at fully opened and fully closed positions.
- F. Obstruction-Detection Devices: External entrapment protection consisting of indicated automatic safety sensor capable of protecting full width of grille opening. Activation of sensor immediately stops and reverses downward grille travel.
1. Photoelectric Sensor: Manufacturer's standard system designed to detect an obstruction in grille opening without contact between grille and obstruction.
 - a. Self-Monitoring Type: Designed to interface with grille operator control circuit to detect damage to or disconnection of sensing device. When self-monitoring feature is activated, grille closes only with sustained or constant pressure on close button.
 2. Electric Sensor Edge: Automatic safety sensor edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor activates device. Connect to control circuit using manufacturer's standard take-up reel or self-coiling cable.
 - a. Self-Monitoring Type: Four-wire-configured device designed to interface with grille operator control circuit to detect damage to or disconnection of sensor edge.

3. Pneumatic Sensor Edge: Automatic safety sensor edge, located within astragal mounted to bottom bar. Contact with sensor activates device.
- G. Control Station: Three-button control station in fixed location with momentary-contact push-button controls labeled "Open" and "Stop" and sustained- or constant-pressure push-button control labeled "Close."
1. Interior-Mounted Units: Full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.
 2. Exterior-Mounted Units: Full-guarded, standard-duty, surface-mounted, weatherproof type; NEMA ICS 6, Type 4 enclosure, key operated.
- H. Emergency Manual Operation: Equip electrically powered grille with capability for emergency manual operation. Design manual mechanism so required force for grille operation does not exceed [25 lbf][30 lbf]<Insert value>.
- I. 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.
- J. Motor Removal: Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency manual operation.
- K. Audible and Visual Signals: Audible alarm and visual indicator lights in compliance with the accessibility standard.
- L. Emergency-Egress Release: Flush, wall-mounted handle mechanism, for accessibility-code-compliant egress feature, not dependent on electric power. The release allows an unlocked grille to partially open without affecting limit switches to permit passage, and it automatically resets motor drive on return of handle to original position.
- M. Self-Opening Mechanism: Automatic release mechanism triggered by [smoke detector,][emergency push-button station,] fire alarm or power failure. When activated, the grille self-opens by means of a fail-safe operator to the fully open position without the need for power operation or battery backup systems. When the[emergency push-button is reset, and the] alarm is cleared and power is restored, the grille will operate normally.
- 2.11 GENERAL FINISH REQUIREMENTS
- A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.12 ALUMINUM FINISHES

- A. Mill Finish: Manufacturer's standard.
- B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
- C. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
- D. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.13 STEEL AND GALVANIZED-STEEL FINISHES

- A. Factory Prime Finish: Manufacturer's standard primer, compatible with field-applied finish. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.
- B. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard baked-on finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

2.14 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.
- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.

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

3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports, according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles, hoods, controls, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with the accessibility standard.
- D. Power-Operated Grilles: Install[automatic garage grille openers] according to UL 325.

3.3 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.
 - 2. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
 - 3. Test grille opening when activated by detector, fire-alarm system, emergency-egress release, or self-opening mechanism as required. Reset grille-opening mechanism after successful test.

3.4 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly, so that grilles operate easily, free of warp, twist, or distortion.
 - 1. Adjust exterior components to be weather resistant.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service is to include [three][six][nine][12] months' full maintenance by skilled employees of coiling-grille Installer. Include [monthly][quarterly] preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper grille operation. Parts and supplies are to be manufacturer's authorized replacement parts and supplies.
 - 1. Perform maintenance, including emergency callback service, during normal working hours.

2. Include 24-hour-per-day, 7-day-per-week, emergency callback service.

3.6 DEMONSTRATION

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

END OF SECTION 08 33 26

SECTION 08 41 13 ALUMINUM FRAMED ENTRANCES AND STOREFRONTS 4.5**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Aluminum Storefront, including:
 - 1. YKK AP Series YES 45 XT Storefront System.
- B. Related Sections:
 - 1. Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.
 - 2. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements.
 - 3. Single Source Requirement: All products listed below shall be by the same manufacturer.
 - a. Section 08 32 13 Sliding Aluminum-Framed Glass Doors.
 - b. Section 08 51 13 Aluminum Windows.
 - c. Section 08 44 13 Glazed Aluminum Curtain Walls.
 - d. Section 08 44 33 Sloped Glazing Assemblies.

1.02 SYSTEM PERFORMANCE DESCRIPTION

- A. Performance Requirements: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.
 - 1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² (1.10 m³/h•m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 PSF (299 Pa).
 - 2. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E 331 at test pressure differential of: 10 PSF (479 Pa) (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing.
 - 3. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane indicated:
 - a. Exterior Walls:
 - 1) Positive Pressure:
 - 2) Negative Pressure:
 - b. Interior Walls (Pressure Acting in Either Direction):
 - 4. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AA Specifications for Aluminum Structures.
 - a. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.
 - b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
 - 5. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
 - 6. Thermal Performance: When tested in accordance with AAMA 507, AAMA 1503, and NFRC 100:
 - a. Condensation Resistance Factor (CRF_p): A minimum of 66 (with a CRF_g of 64.)
 - b. Thermal Transmittance U Value: 0.36 BTU/HR/FT²/°F or less.
 - 7. Acoustical Performance: Acoustical Performance: When tested in accordance with AAMA 1801:
 - a. Sound Transmission Class (STC) shall not be less than 32 for 1" standard insulating unit; 36 for laminated glazing.
 - b. Outdoor-Indoor Transmission Class (OITC) shall not be less than 27 for 1" standard insulating unit; 30 for laminated glazing.

1.03 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."
- B. Product Data: Submit product data for each type storefront series specified.

- D. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors and textures.
- E. Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range expected in installed system.
- F. Quality Assurance / Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Installer Qualification Data: Submit installer qualification data.
- G. Closeout Submittals:
 - 1. Warranty: Submit warranty documents specified herein.
 - 2. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Closeout (Project Record Documents) Section.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project. If requested by Owner, submit reference list of completed projects.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction process.
- B. Mock-Ups (Field Constructed): Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.
 - 1. Mock-Up Size:
 - 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. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.05 PROJECT CONDITIONS / SITE CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.06 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by an authorized company official.
 - 1. Warranty Period: Manufacturer's one (1) year standard warranty commencing on the substantial date of completion for the project provided that the warranty, in no event, shall start later than six (6) months from the date of shipment by YKK AP America Inc.

PART 2 PRODUCTS

2.01 MANUFACTURERS (Acceptable Manufacturers/Products)

- A. Acceptable Manufacturers: YKK AP America Inc.
101 Marietta Street NW, Suite 2100
Atlanta, GA 30303
Telephone: (678) 838-6000; Fax: (678) 838-6001
 - 1. Storefront System: YKK AP YES 45 XT Storefront System.
 - 2. OR EQUAL
- B. Storefront Framing System:
 - 1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery.
 - 2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts,

entrance door framing, and indicated shapes.

3. Dual Thermal Barrier: Provide dual continuous thermal barriers by means of poured and debridged pockets consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum by YKK ThermoBond Plus®. Systems employing non-structural thermal barriers are not acceptable.

2.02 MATERIALS

- A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.
- B. Aluminum Sheet:
 1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050" (1.27 mm) minimum thickness.
 2. Painted Finish: ASTM B 209 (ASTM B 209M), 3003-H14 Aluminum Alloy, 0.080" (1.95 mm) minimum thickness.

2.03 ACCESSORIES

- A. Manufacturer's Standard Accessories:
 1. Fasteners: Zinc plated steel concealed fasteners; Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners.
 2. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; Glazing gaskets in accordance with ASTM C 864.
 3. 0.050 Aluminum Sill Flashing End Dams must have 3 point attachment.

2.04 RELATED MATERIALS (Specified In Other Sections)

- A. Glass: Refer to Division 8 Glass and Glazing Section for glass materials.

2.05 FABRICATION

- A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with uniform hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.
 1. Hardware: Drill and cut to template for hardware. Reinforce frames and door stiles to receive hardware in accordance with manufacturer's recommendations.
 2. Welding: Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

2.06 FINISHES AND COLORS

- A. YKK AP America Anodized Plus® Finish:

YB1N Medium Bronze Anodized Plus®

Anodized Plus® is an advanced sealing technology that completely seals the anodic film yielding superior durability (See AAMA 612).

- B. Anodized Finishing: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:
 1. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612. Aluminum extrusions shall be produced from quality controlled billets meeting AA-6063-T5.
 - a. Exposed Surfaces shall be free of scratches and other serious blemishes.
 - b. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.
 - c. The anodized coating shall comply with all of the requirements of AAMA 612: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.
 - d. Overall coating thickness for finishes shall be a minimum of 0.7 mils.

- 2) CASS Corrosion Resistance Test, CASS 240/ASTM B368 Test Method.
 - 3) Other AAMA 2605 Performance Tests specified in these specifications, such as: 7.3 Dry Film Hardness; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.
- C. Finishes Testing:
1. Apply 0.5% solution NaOH, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes; lightly wipe off NaOH; Do not clean area further.
 2. Submit samples with test area noted on each sample.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS / RECOMMENDATIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, installation instructions, and product carton instructions. The latest installation manual is available at www.ykkap.com.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
1. Aluminum Surface Protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.04 INSTALLATION

- A. General: Install manufacturer's system in accordance with shop drawings, and within specified tolerances.
1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
 2. Shim and brace aluminum system before anchoring to structure.
 3. Provide sill flashing at exterior storefront systems. Extend extruded flashing continuous with splice joints; set in continuous beads of sealant.
 4. Verify storefront system allows water entering system to be collected in gutters and wept to exterior. Verify metal joints are sealed in accordance with manufacturers installation instructions.
 5. Locate expansion mullions where indicated on reviewed shop drawings.
 6. Seal metal to metal storefront system joints using sealant recommended by system manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon request, provide manufacturer's field service consisting of site visit for inspection of product installation in accordance with manufacturer's instructions.
- B. Field Test: Conduct field test to determine watertightness of storefront system. Conduct test in accordance with AAMA 501.2.

3.06 ADJUSTING AND CLEANING

- A. Adjusting: Adjust swing doors for operation in accordance with manufacturer's recommendations.
- B. Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to owner's acceptance, and remove construction debris from project site. Legally dispose of debris.
- C. Protection: The General Contractor shall protect the installed product's finish surfaces from damage during construction.

END OF SECTION

SECTION 08 42 29.23 – SLIDING AUTOMATIC ENTRANCES

PART 1 - GENERAL

1.1 SUMMARY

- A. This section includes the following types of automatic entrance doors:
 - 1. Exterior and interior telescopic sliding automatic entrances.
- B. Related Sections:
 - 1. Division 7 Sections for caulking to the extent not specified in this section.
 - 2. Division 8 Section "Glazing" for materials and installation requirements of glazing for automatic entrance doors.
 - 3. Division 26 and 28 Sections for electrical connections including conduit and wiring for automatic entrance door operators and access control devices.

1.2 REFERENCES

- A. References: Refer to the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 101 - Life Safety Code.
- B. American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA) - ANSI/BHMA A156.10 and ANSI Z97.1 Standards for Safety Glazing Material Used in Buildings.
- C. Underwriters Laboratories (UL) - UL 325 Standard for Safety for Door, Drapery, Gate, Louver and Window Operators and Systems.
- D. American Association of Automatic Door Manufacturers (AAADM).
- E. American Society for Testing and Materials (ASTM) - ASTM B221 and ASTM B209
- F. American Architectural Manufacturers Association (AAMA) - AAMA 611
- G. National Association of Architectural Metal Manufacturers (NAAMM).
- H. International Code Council (ICC) - IBC: International Building Code (as per local adoption).

1.3 DEFINITIONS

- A. Activation Device: Device that, when actuated, sends an electrical signal to the door operator to activate the operation of the door.
- B. Knowing act: Consciously initiating the opening of a power operated door using acceptable methods including wall mounted switches such as push plates and controlled access devices such as keypads, card readers and key switches.

- C. Safety Device: A device that detects the presence of an object or person within a zone where contact could occur and provides a signal to stop the movement of the door.

1.4 PERFORMANCE REQUIREMENTS

- A. Compliance with the following:
 - 1. ANSI/BHMA A156.10 American National Standard for Power Operated Pedestrian Doors.
 - 2. UL 325 listed.
- B. Automatic door equipment accommodates medium to heavy pedestrian traffic.
- C. Entrapment Force Requirements:
 - 1. Power Operated Sliding Doors: Not more than 30 lbf (133 N) required to prevent stopped door from closing.
 - 2. Sliding doors provided with a breakaway device shall require no more than 50 lbf (222N) applied 1 inch (25 mm) from the leading edge of the lock stile for the breakout panel to open.

1.5 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, fabrication, operational descriptions and finishes.
- B. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections and details, indicating dimensions, materials, and fabrication of doors, frames, sidelites, operator, motion /presence sensor control device, anchors, hardware, finish, options and accessories.
- C. Samples: Submit manufacturer's samples of aluminum finish.
- D. Manufacturers Field Reports: Submit manufacturer's field reports from AAADM certified technician of inspection and approval of doors for compliance with ANSI/BHMA A156.10 after completion of installation.
- E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door opening installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the entrance and their nearest service representatives. The final copies delivered after completion of the installation test to include spare parts list.
- F. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.6 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 10 years of documented experience in manufacturing of doors and equipment of similar to that indicated

for this Project and that have a proven record of successful in-service performance. Manufacturer to have a company certificate issued by AAADM.

- B. Installer Qualifications: Installers, trained by the primary product manufacturers, with a minimum 3 years documented experience installing and maintenance of units 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.
- C. Certified Inspector Qualifications: Certified by AAADM.
- D. Source Limitations for Automatic Entrances: Obtain each type of door, frame, operator and sensor components specified in this Section from a single source, same manufacturer unless otherwise indicated.
- E. Power-Operated Pedestrian Door Standard: ANSI/BHMA A156.10 (current version).
- F. Emergency Exit door requirements: Comply with requirements of authorities having jurisdiction for automatic entrance doors serving as a required means of egress.

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual dimensions of openings to receive automatic entrances by field measurements before fabrication and indicate on shop drawings.

1.8 COORDINATION

- A. Coordinate sizes and locations of recesses in concrete floors for recessed tracks and thresholds if applicable. Concrete work is specified in Division 03.
- B. Electrical System Roughing-in: Coordinate layout and installation of automatic entrances with connections to power supplies and access control system as applicable.

1.9 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Automatic Entrance Doors shall be free of defects in material and workmanship for a period of One (1) year from the date of substantial completion.
- C. During the warranty period a factory-trained technician shall perform service and affect repairs. An inspection shall be performed after each adjustment or repair.
- D. During the warranty period all warranty work, including but not limited to emergency service, shall be performed during normal business hours.
- E. Manufacturer shall have in place a dispatch procedure that shall be available 24 hours a Day, 7 Days a week for emergency call back service.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Manufacturer Basis of Design: ASSA ABLOY Entrance Systems, 1900 Airport Road, Monroe, NC 28110
- B. Manufacturer shall provide installation with factory trained and AAADM certified technicians.
- C. Substitutions will be considered when submitted in conformance with Substitution specifications.

2.2 SLIDING AUTOMATIC ENTRANCES

- A. Sliding automatic entrance system including the following:
 - 1. Sliding panels, sidelites and aluminum frame.
 - 2. Overhead concealed, electro-mechanical operator.
 - 3. Operator housing, guide system and carrier assemblies.
 - 4. Controls and accessories as required for a complete installation.
- B. ASSA ABLOY SL500 Telescopic (Basis of Design) Automatic Sliding Entrance with Stile and Rail Panels:
 - 1. Telescopic single slide, full breakout, door system.
 - a. Configuration: Single slide, three equal panel unit with two operable leaves and one sidelite.
 - b. Traffic Pattern: Two-way.
 - c. Emergency Breakaway Capability: Sliding leaves and sidelite.
 - d. Mounting: Overhead header installed between jambs.

2.3 ENTRANCE COMPONENTS

- A. Stile and Rail Sliding Panels and Sidelites:
 - 1. Material: Extruded Aluminum, Alloy 6063-T5.
 - 2. Door panels shall have a minimum .125 inch (3.2 mm) structural wall thickness including adjoining horizontal members and perimeter frames where applicable.
 - 3. Door Construction shall be by means of an integrated corner block with 3/8 inch all-thread through bolt from each stile.
 - 4. Glass stops shall be .062 inch (15.8 mm) wall thickness and shall provide security function as a standard by means of a fixed non-removable exterior section with glazing to be performed from the interior only.
 - 5. Full breakout sliding entrances shall include two interlocks per moving panel securing the leading stile of the sidelite and the butt stile of the sliding door panel together.
 - 6. Vertical Stiles shall be narrow stile 2-1/8 inch
 - 7. Bottom Rails shall be 4 inch
 - 8. Intermediate Muntin shall be 4 inch
 - 9. Weather-Stripping: Slide-in type, replaceable pile mohair seals retained by the aluminum extrusions. The following types of weather-stripping are required: complementing weather-stripping on the joining vertical stiles of the sidelite and sliding door panels, complementing weather-stripping on the lead edge of the lock stiles of bi-parting doors, single pile weather-stripping between the carrier and the header,

single pile weather-stripping on the lead edge stile of single slide door panels, dual pile weather-stripping on the pivot stile of breakout sidelite panels, and dual pile weather-stripping on the butt stile of fixed sidelite panels. Bottom rails shall be provided with an adjustable nylon sweep.

10. Glass: Glazing shall comply with ANSI Z97.1, thickness as indicated.
 - a. Exterior Door Glazing Sliding Panels and Sidelite Panels: 1" clear insulated glass with tempered panes.
 - b. Vestibule Door Glazing Sliding Panels and Sidelite Panels: 1/4" clear tempered glass
- B. Door Carriers: Manufacturer's standard carrier assembly that allows vertical adjustment.
 1. Carriage Assembly: Carriage bar with two wheel assemblies. Each assembly shall have tandem roller wheels.
 2. Roller Wheels: Two heavy duty Delrin roller wheels per wheel assembly, for a total of four (4) roller wheels, 1-7/16 inch diameter, per active door leaf for operation over a replaceable aluminum track. Single journal with sealed oil impregnated bearings.
 3. Two (2) heavy duty self-aligning anti-risers per leaf.
- C. Framing Members: Provide automatic entrances as complete assemblies. Manufacturer's standard extruded aluminum framing reinforced as required to support loads.
 1. Vertical Jambs: 1-3/4 inches 6 inches.
- D. Header: Manufacturer's standard extruded aluminum header with a replaceable aluminum track extending full width of entrance unit. Header to conceal door operators, carrier assemblies, and roller track; complete with hinged access panel for service of door operator, and controls.
 1. Header Span: Maximum 14'-0" for full breakout entrances and 16'-0" for fixed sidelite entrances without intermediate supports when using 1/4-inch glass.
 - a. Capacity: Capable of supporting active breakout leafs up to maximum of 220 lb per leaf when header is supported per manufacturer's recommendations.
 2. Header Size: 6-1/2 inches wide by 7 inches high.
 - a. Header height including the sensor plate cap which spans the clear door opening width is 8 inches high.
 3. Header Access: Continuous hinge at top of header allows cover to swing and allow complete access to operator and internal electronic and mechanical assemblies.
 4. Design: Closed header when doors in closed position.

2.4 HARDWARE

- A. Hardware: Provide manufacturer's standard hardware as required for operation indicated.
 1. Breakaway arms and bottom pivot assemblies shall be supplied by the manufacturer and shall be adjustable to comply with applicable codes.
 2. Magnetic catch(s) to retain breakout door and sidelite panels in the closed position.
 3. Hydraulic closer(s) to return breakout door and sidelite panels to the closed position.
 - a. Magnetic catch(s) to retain breakout door and sidelite panels in the closed position.
 4. Wind resistant hydraulic damper to control movement of breakout panels.
 5. Locking hardware shall be provided as indicated.

- a. Electrified slide lock shall automatically lock the sliding function of all sliding door panels within the entrance when the door panels are in the closed position.
 - 1) Fail safe operation: Slide lock shall unlock the sliding function of the door panels upon loss of power.
 - 2) Exterior jamb mounted key switch to unlock sliding door operation.
 - b. Exit devices shall lock the breakout function while allowing emergency egress at all times. Exit devices in combination with the automatic slide locking hardware to be provided on secured doors. Automatic locking for the sliding door when the door control switch is in the closed position.
 - 1) Flush mounted Adams-Rite F86 Series, concealed vertical rod exit devices mounted to the leading sliding panels.
- B. Guide Track/Threshold: Manufacturer's threshold as indicated.
- 1. Full Breakout Entrance Guide Track: Recessed floor mounted aluminum guide track(s) adjacent to the sidelite portion of the sliding automatic door assembly.
 - a. Surface mounted threshold with interlocking ADA accessible ramps. Recessed mounted threshold.

2.5 DOOR OPERATORS AND CONTROLS

- A. Door Operator and Controller:
- 1. Electro-mechanical controlled unit utilizing a high-efficiency, energy efficient, DC motor requiring a maximum of 3 amp current draw, allowing 5 operators on one 20 amp circuit. The supplied system shall have the capability to operate at full performance well beyond a brown out and high line voltage conditions (85V – 265V) sensing changes and adjusting automatically. The operator shall allow an adjustable hold open time delay of 0 to 60 seconds and have internal software to incorporate a self-diagnostic system.
 - 2. Operating Temperature Range: -31° F to 130° F.
- B. Microprocessor Control Box:
- 1. Modular control unit to allow for changing technology. Factory-adjusted configuration with opening and closing speeds set to comply with ANSI/BHMA A156.10 requirements and electronic dampening to reduce wear on drive train. Should the drive train operations deviate from design criteria ranges, Watchdog Control Circuit Monitoring will assume command of the system and shut down the automatic function allowing a secondary supervisory circuit to perform as a backup. Control unit shall allow the following functions:
 - a. Diagnostics with the ability to produce application data.
 - 2. Mode Selector Control:
 - a. Multi-position keyed cylinder mode selector control shall allow selection of the indicated functions to be engaged when switch is turned to the appropriate setting.
 - b. Mode Selector Control Mounting: Control shall be mounted as indicated:
 - 1) Jamb mounted.
 - c. Mode selector control to allow the following functions:
 - 1) "Off"
 - 2) "Exit Only" one way traffic with automatic operation from the interior.

- 3) "Two Way Traffic" allowing automatic operation from exterior and interior.
- 4) "Partial Opening" energy saving door position allows door to automatically adjust opening width based on amount of usage, that is, full open during high use and partial open during low use. The control for this setting is programmable allowing adjustment to both the usage setting and the opening width.
- 5) "Hold Open" doors activated and held in the full open position.

2.6 ACTIVATION AND SAFETY CONTROL DEVICES

- A. General: Provide the types of activation and safety devices specified in accordance with ANSI/BHMA standards, for the condition of exposure and for long-term, maintenance-free operation under normal traffic load for type of occupancy indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Combination Activation Motion Sensor/Safety Presence Sensor:
 1. Shall be a sliding door sensor utilizing K-band microwave technology to detect motion and focused active infrared technology to detect presence, combined in a single housing surface mounted on each side of the header.
 - a. Presence sensor shall remain active at all times.
 - b. The sensor shall communicate with the automatic door operator through a self-monitoring connection that allows the door to go into a fail-safe mode preventing the door from closing in the event of a sensor failure.
 2. Motion/presence detecting sensors to be field installed and adjusted.

2.7 ELECTRICAL

- A. High-Efficiency DC Motor: Maximum of 3 amp current draw, allowing 5 operators to run on one 20 Amp circuit.
- B. Power: Self-detecting line voltage capable control. 120 VAC through 240 VAC, 50/60 Hz, 3 amp minimum incoming power with solid earth ground connection for each door system.
- C. Key Impulse Input: Input for card readers or remote activation with independent adjustable hold open delay.
- D. Wiring: Separate internal channel raceway free from moving parts.
- E. Brown out / high voltage capability: System has capability to operate at full performance well beyond brown out and high voltage line conditions (85 V – 265 V) sensing changes and adjusting automatically.
- F. Convenience Battery: Shall be concealed in header and capable of full operation with blackout conditions, including sensor capabilities for minimum of 100 cycles.

2.8 ALUMINUM FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. TBD by architect from manufacturers full range of colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, wall and floor construction, and other conditions affecting performance.
- B. Examine roughing-in for electrical source power to verify actual locations of wiring connections.
- C. Proceed only after such discrepancies or conflicts have been resolved.

3.2 INSTALLATION

- A. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints.
- 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.
- C. Door Operators: Connect door operators to electrical power distribution system as specified in Division 26 Sections.
- D. Glazing: Glaze sliding automatic entrance door panels in accordance with the Glass Association of North America (GANA) Glazing Manual, published recommendations of glass product manufacturer, and published instructions of automatic entrance system manufacturer.
- E. Sealants: Comply with requirements specified in division 7 Section "Joint Sealants" to provide a weather tight installation.
 - 1. Set thresholds, bottom guide and track systems and framing members in full bed of sealant.
 - 2. Seal perimeter of framing members with sealant.
- F. Signage: Apply signage on both sides of each door and sidelite as required by ANSI/BHMA A156.10 and manufacturers installation instructions.

3.3 ADJUSTING

- A. Adjust door operators, controls and hardware for smooth and safe operation and for weather tight closure. Adjust doors in compliance with ANSI/BHMA A156.10.
- B. Verify installation and alignment of all entrance weather-stripping as required for compliance with specified air infiltration requirements.

3.4 FIELD QUALITY CONTROL

- A. Before placing doors into operation, AAADM certified technician shall inspect and approve doors for compliance with ANSI/BHMA A156.10. Certified technician shall be approved by the manufacturer.

3.5 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door installation.
- B. Clean glass and metal surfaces promptly after installation. Remove excess sealants, compounds, dirt and other substances. Repair damages to match original finish.

3.6 DEMONSTRATION

- A. Engage a factory-authorized representative to train Owner's maintenance personnel to adjust, operate, and maintain safe operation of the door.

END OF SECTION

SECTION 08 43 13 ALUMINUM FRAMED ENTRANCES & STOREFRONTS 6**PART 1 GENERAL****1.01 SUMMARY**

- A. Section Includes: Aluminum Storefront, including:
 - 1. YKK AP Series YES 60 XT Storefront System.
- B. Related Sections:
 - 1. Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.
 - 2. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements.
 - 3. Single Source Requirement: All products listed below shall be by the same manufacturer.
 - a. Section 08 32 13 Sliding Aluminum-Framed Glass Doors.
 - b. Section 08 51 13 Aluminum Windows.
 - c. Section 08 44 13 Glazed Aluminum Curtain Walls.
 - d. Section 08 44 33 Sloped Glazing Assemblies.

1.02 SYSTEM PERFORMANCE DESCRIPTION

- A. Performance Requirements: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.
 - 1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² (1.10 m³/h•m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 PSF (299 Pa).
 - 2. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E 331 at test pressure differential of: 12 PSF (575 Pa) (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing.
 - 3. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane indicated:
 - a. Exterior Walls:
 - 1) Positive Pressure:
 - 2) Negative Pressure:
 - b. Interior Walls (Pressure Acting in Either Direction):
 - 4. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AA Specifications for Aluminum Structures.
 - a. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.
 - b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
 - 5. Seismic: When tested in accordance with AAMA 501.4, system must meet design displacement of 0.010 x the story height and ultimate displacement no greater than 2".
 - 6. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
 - 7. Thermal Performance: When tested in accordance with AAMA 507, AAMA 1503, and NFRC 100:
 - a. Condensation Resistance Factor (CRF_p): A minimum of 72 (with a CRF_g of 67.)
 - b. Thermal Transmittance U Value: 0.38 BTU/HR/FT²/°F or less.
 - 8. Acoustical Performance: Acoustical Performance: When tested in accordance with AAMA 1801:
 - a. Sound Transmission Class (STC) shall not be less than 31 for 1" standard insulating unit; 34 for laminated glazing.
 - b. Outdoor-Indoor Transmission Class (OITC) shall not be less than 25 for 1" standard insulating unit; 28 for laminated glazing.

1.03 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar

submittals are defined in "Conditions of the Contract."

- B. Product Data: Submit product data for each type storefront series specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors and textures.
- E. Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range expected in installed system.
- F. Quality Assurance / Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Installer Qualification Data: Submit installer qualification data.
- G. Closeout Submittals:
 - 1. Warranty: Submit warranty documents specified herein.
 - 2. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Closeout (Project Record Documents) Section.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project. If requested by Owner, submit reference list of completed projects.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction process.
- B. Mock-Ups (Field Constructed): Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.
 - 1. Mock-Up Size:
 - 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. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.05 PROJECT CONDITIONS / SITE CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.06 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by an authorized company official.
 - 1. Warranty Period: Manufacturer's one (1) year standard warranty commencing on the substantial date of completion for the project provided that the warranty, in no event, shall start later than six (6) months from the date of shipment by YKK AP America Inc.

PART 2 PRODUCTS

2.01 MANUFACTURERS (Acceptable Manufacturers/Products)

- A. Acceptable Manufacturers: YKK AP America Inc.
101 Marietta Street NW, Suite 2100
Atlanta, GA 30303
Telephone: (678) 838-6000; Fax: (678) 838-6001
 - 1. Storefront System: YKK AP YES 60 XT Storefront System.
 - 2. OR EQUAL
- B. Storefront Framing System:
 - 1. Description: Center set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery.

2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts, entrance door framing, and indicated shapes.
3. Dual Thermal Barrier: Provide dual continuous thermal barriers by means of poured and debridged pockets consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum by YKK ThermaBond Plus®. Systems employing non-structural thermal barriers are not acceptable.

2.02 MATERIALS

- A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.
- B. Aluminum Sheet:
 1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050" (1.27 mm) minimum thickness.
 2. Painted Finish: ASTM B 209 (ASTM B 209M), 3003-H14 Aluminum Alloy, 0.080" (1.95 mm) minimum thickness.

2.03 ACCESSORIES

- A. Manufacturer's Standard Accessories:
 1. Fasteners: Zinc plated steel concealed fasteners; Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners.
 2. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; Glazing gaskets in accordance with ASTM C 864.
 3. 0.050 Aluminum Sill Flashing End Dams must have 3 point attachment.

2.04 RELATED MATERIALS (Specified In Other Sections)

- A. Glass: Refer to Division 8 Glass and Glazing Section for glass materials.

2.05 FABRICATION

- A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with uniform hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.
 1. Hardware: Drill and cut to template for hardware. Reinforce frames and door stiles to receive hardware in accordance with manufacturer's recommendations.
 2. Welding: Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

2.06 FINISHES AND COLORS

- A. YKK AP America Anodized Plus® Finish:

YB1N Medium Bronze Anodized Plus®

Anodized Plus® is an advanced sealing technology that completely seals the anodic film yielding superior durability (See AAMA 612).

- B. Anodized Finishing: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:
 1. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612. Aluminum extrusions shall be produced from quality controlled billets meeting AA-6063-T5.
 - a. Exposed Surfaces shall be free of scratches and other serious blemishes.
 - b. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.
 - c. The anodized coating shall comply with all of the requirements of AAMA 612: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction sites, and to resist the loss of color and gloss.

- d. Overall coating thickness for finishes shall be a minimum of 0.7 mils.
 - 2) CASS Corrosion Resistance Test, CASS 240/ASTM B368 Test Method.
 - 3) Other AAMA 2605 Performance Tests specified in these specifications, such as: 7.3 Dry Film Hardness; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.
- C. Finishes Testing:
 - 1. Apply 0.5% solution NaOH, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes; lightly wipe off NaOH; Do not clean area further.
 - 2. Submit samples with test area noted on each sample.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS / RECOMMENDATIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, installation instructions, and product carton instructions. The latest installation manual is available at www.ykkap.com.

3.02 EXAMINATION

- A. Site Verification of Conditions: Verify conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
 - 1. Aluminum Surface Protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.04 INSTALLATION

- A. General: Install manufacturer's system in accordance with shop drawings, and within specified tolerances.
 - 1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
 - 2. Shim and brace aluminum system before anchoring to structure.
 - 3. Provide sill flashing at exterior storefront systems. Extend extruded flashing continuous with splice joints; set in continuous beads of sealant.
 - 3. Verify storefront system allows water entering system to be collected in gutters and wept to exterior. Verify metal joints are sealed in accordance with manufacturers installation instructions.
 - 5. Locate expansion mullions where indicated on reviewed shop drawings.
 - 6. Seal metal to metal storefront system joints using sealant recommended by system manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon request, provide manufacturer's field service consisting of site visit for inspection of product installation in accordance with manufacturer's instructions.
- B. Field Test: Conduct field test to determine watertightness of storefront system. Conduct test in accordance with AAMA 501.2.

3.06 ADJUSTING AND CLEANING

- A. Adjusting: Adjust swing doors for operation in accordance with manufacturer's recommendations.
- B. Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to owner's acceptance, and remove construction debris from project site. Legally dispose of debris.
- C. Protection: The General Contractor shall protect the installed product's finish surfaces from damage during construction.

END OF SECTION

SECTION 08 44 13 GLAZED ALUMINUM CURTAINWALLS
PART 1 GENERAL**1.01 SUMMARY**

- A. Section Includes: Glazed Aluminum Curtain Walls:
 - 1. YKK AP Series YCW 750 XT Aluminum Curtain Wall System
- B. Related Sections:
 - 1. Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.
 - 2. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements.
 - 3. Single Source Requirement: All products listed below shall be by the same manufacturer.
 - a. Section 08 32 13 Sliding Aluminum-Framed Glass Doors.
 - b. Section 08 41 13 Aluminum-Framed Entrances and Storefronts.
 - c. Section 08 51 13 Aluminum Windows.
 - d. Section 08 44 33 Sloped Glazing Assemblies.

1.02 SYSTEM PERFORMANCE DESCRIPTION

- A. Performance Requirements: Provide aluminum curtain wall systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.
 - 1. Air Infiltration: Completed curtain wall systems shall have 0.06 CFM/FT² (1.10 m³/h·m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 PSF (299 Pa).
 - 2. Water Infiltration:
 - a. No uncontrolled water on indoor face of any component when tested in accordance with ASTM E 331 at a static pressure of 15 PSF (718 Pa).
 - b. No uncontrolled water on indoor face of any component when tested in accordance with AAMA 501.1 at a dynamic pressure of 15 PSF (718 Pa).
 - 3. Optional Incidental Water Management: Head member shall be capable of directing condensation from the wall Cavity above the curtain wall to the exterior of the system.
 - 4. Wind Loads: Completed curtain wall system shall withstand wind pressure loads normal to wall plane indicated:
 - a. Exterior Walls:
 - 1) Positive Pressure:
 - 2) Negative Pressure:
 - b. Interior Walls (Pressure Acting in Either Direction):
 - 5. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AA Specifications for Aluminum Structures.
 - a. For spans less than 13'-6" (4.1m): L/175 or 3/4" (19.1mm) maximum. .
 - b. For spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m): L/175 or L/240 + 1/4" (6.4mm).
 - 6. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
 - 7a. Thermal Performance:
 - a. YCW 750 XT when tested in accordance with AAMA 1503., AAMA 507, and NFRC 100 based on 2" clear high performance glass, 1/4" Viracon VE1-85 (e=02040*, #2) Heat-Strengthened, 0.69" Gap, Aluminum Spacer (A1-D), Air-Filled*, 1/4" Viracon VE1-85 (e=0.088*, #4) Heat-Strengthened, 0.69" Gap, Aluminum Spacer (A1-D), Air-Filled*, 1/4" Clear Heat-Strengthened, having a center of glass U-factor of 0.16 BTU/HR/FT²/°F.
 - b. Condensation Resistance Factor (CRF_f): 82
 - c. Thermal Transmittance U-Factor: 0.24 BTU/HR/FT²/°F or less.
 - 8. Acoustical Performance: When tested in accordance with AAMA 1801:
 - a. Sound Transmission Class (STC) shall not be less than 32 for heat strengthened; 35 for laminated glazing.

- b. Outdoor–Indoor Transmission Class (OITC) shall not be less than 27 for heat strengthened; 30 for laminated glazing.

1.03 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with “Conditions of the Contract” and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in “Conditions of the Contract.”
- B. Product Data: Submit product data for each type curtain wall series specified.
- C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors and textures.
- D. Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range expected in installed system.
- F. Quality Assurance / Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Installer Qualification Data: Submit installer qualification data.
- G. Closeout Submittals:
 - 1. Warranty: Submit warranty documents specified herein.
 - 2. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Closeout (Project Record Documents) Section.

1.04 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project. If requested by Owner, submit reference list of completed projects.
 - 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction process.

1.05 PROJECT CONDITIONS / SITE CONDITIONS

- A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.06 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by an authorized company official.
 - 1. Warranty Period: Manufacturer's one (1) year standard warranty commencing on the substantial date of completion for the project provided that the warranty, in no event, shall start later than six (6) months from the date of shipment by YKK AP America Inc.

PART 2 PRODUCTS

2.01 MANUFACTURERS (Acceptable Manufacturers/Products)

- A. Acceptable Manufacturers:
 - YKK AP America Inc.
101 Marietta Street NW, Suite 2100
Atlanta, Georgia 30303
Telephone: (678) 838-6000; Fax: (678) 838-6001
 - 1. Curtain Wall System: YKK AP YCW 750 XT Aluminum Curtain Wall System.
 - 2. Or equal substitutions are allowed when submitted within constraints of Substitution section
- B. Curtain Wall Framing System:
 - 1. Description: Framing shall be thermally broken. Horizontal and vertical framing members shall have

a nominal face dimension of 2-1/2 inches. Depth as indicated on drawings. Framing system shall provide a flush glazed appearance on all sides with no protruding glass stops.

2. Thermal Barrier: Provide continuous thermal barrier by means of 6/6 nylon polyamide glass fiber reinforced pressure extruded bars. Systems employing non-structural thermal barriers are not acceptable.

2.02 MATERIALS

- A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 and 6063-T6 Aluminum Alloys.
- B. Aluminum Sheet:
 1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050" (1.27 mm) minimum thickness.
 3. Thermal Barrier: Provide YKK AP MegaTherm® continuous thermal barrier by means of 6/6 nylon polyamide glass fiber reinforced pressure extruded bars. Systems employing non-structural thermal barriers are not acceptable.

2.03 ACCESSORIES

- A. Manufacturer's Standard Accessories:
 1. Fasteners: Zinc plated steel concealed fasteners; Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners, countersunk, finish to match aluminum color.
 2. Sealant: Non-skinning type, AAMA 803.3
 3. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; Glazing gaskets in accordance with ASTM C 864.

2.04 RELATED MATERIALS (Specified In Other Sections)

- A. Glass: Refer to Division 8 Glass and Glazing Section for glass materials.

2.05 FABRICATION

- A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.

2.06 FINISHES AND COLORS

- A. YKK AP America Anodized Plus® Finish:

YB1N Medium Bronze Anodized Plus®

* Indicates standard finish usually carried as inventory.

Anodized Plus® is an advanced sealing technology that completely seals the anodic film yielding superior durability (See AAMA 612).

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS / RECOMMENDATIONS

- A. Compliance: Comply with manufacturer's product data, including product technical bulletins, installation instructions, and product carton instructions. The latest Installation Manual can be found at www.ykkap.com.

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. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during

product installation.

3.04 INSTALLATION

- A. General: Install manufacturer's system in accordance with shop drawings, and within specified tolerances.
 - 1. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
 - 2. Shim and brace aluminum system before anchoring to structure.
 - 3. Verify curtain wall system allows water entering system to be collected in gutters and wept to the exterior. Verify weep holes are open, and metal joints are sealed in accordance with manufacturers installation instructions.
 - 4. Seal metal to metal curtain wall system joints using sealant recommended by system manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Upon request, provide manufacturer's field service consisting of site visit for inspection of product installation in accordance with manufacturer's instructions.
- B. Field Test: Conduct field test to determine watertightness of curtain wall system. Conduct test in accordance with AAMA 501.2.

3.06 ADJUSTING AND CLEANING

- A. Adjusting: Adjust operating items as recommended by manufacturer.
- B. Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance, and remove construction debris from project site. Legally dispose of debris.
- C. Protection: The General Contractor shall protect installed product's finish surfaces from damage during construction.

END OF SECTION

This document supersedes all previous versions.

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes commercial door hardware for the following:
 - 1. Swinging doors.
 - 2. Sliding doors.
 - 3. Other doors to the extent indicated.
- B. Door hardware includes, but is not necessarily limited to, the following:
 - 1. Mechanical door hardware.
 - 2. Electromechanical door hardware.
 - 3. Automatic operators.
 - 4. Cylinders specified for doors in other sections.
- C. Related Sections:
 - 1. Division 08 Section "Hollow Metal Doors and Frames".
 - 2. Division 08 Section "Flush Wood Doors".
 - 3. Division 08 Section "Aluminum-Framed Entrances and Storefronts".
 - 4. Division 08 Section "All-Glass Entrances".
 - 5. Division 26 Section "Electrical".
 - 6. Division 28 Section "Access Control Hardware Devices".
- D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
 - 1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
 - 2. ICC/IBC - International Building Code.
 - 3. NFPA 70 - National Electrical Code.
 - 4. NFPA 80 - Fire Doors and Windows.
 - 5. NFPA 101 - Life Safety Code.
 - 6. NFPA 105 - Installation of Smoke Door Assemblies.
 - 7. UL/ULC and CSA C22.2 - Standards for Automatic Door Operators Used on Fire and Smoke Barrier Doors and Systems of Doors.
 - 8. State Building Codes, Local Amendments.

- E. Standards: All hardware specified herein shall comply with the following industry standards as applicable. Any undated reference to a standard shall be interpreted as referring to the latest edition of that standard:

1. ANSI/BHMA Certified Product Standards - A156 Series.
2. UL10C - Positive Pressure Fire Tests of Door Assemblies.
3. ANSI/UL 294 - Access Control System Units.
4. UL 305 - Panic Hardware.
5. ANSI/UL 437- Key Locks.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
- B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing, fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
 2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
 3. 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 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.
 - g. Door and frame sizes and materials.
 - h. Warranty information for each product.
 4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
- C. Shop Drawings: Details of electrified access control hardware indicating the following:

1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
 - a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
 - b. Complete (risers, point-to-point) access control system block wiring diagrams.
 - c. Wiring instructions for each electronic component scheduled herein.
 2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.
- D. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.
- E. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

1.4 CLOSEOUT SUBMITTALS

- A. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Procedures.
- B. Project Record Documents: Provide record documentation of as-built door hardware sets in digital format (.pdf, .docx, .xlsx, .csv) and as required in Division 01, Project Record Documents.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.
- B. Certified Products: Where specified, products must maintain a current listing in the Builders Hardware Manufacturers Association (BHMA) Certified Products Directory (CPD).
- C. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified 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.

- D. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.
- E. Integrated Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers are to be factory trained, certified prior to project bid, and a direct purchaser of the specified product. Installers are to be factory trained, certified prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project.
- F. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
 - 1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
 - 2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.
- G. Each unit to bear third party permanent label indicating compliance with the referenced testing standards.
- H. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
 - 1. Function of building, purpose of each area and degree of security required.
 - 2. Plans for existing and future key system expansion.
 - 3. Requirements for key control storage and software.
 - 4. Installation of permanent keys, cylinder cores and software.
 - 5. Address and requirements for delivery of keys.
- I. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
 - 1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.

2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures

- J. At completion of installation, provide written documentation that components were applied according to manufacturer's instructions and recommendations and according to approved schedule.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
- 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.
- C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
- B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
- C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.8 WARRANTY

- A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship

within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:

1. Structural failures including excessive deflection, cracking, or breakage.
 2. Faulty operation of the hardware.
 3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 4. Electrical component defects and failures within the systems operation.
- C. Warranty Period: Unless otherwise indicated, warranty shall be one year 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 Door Hardware Sets and each referenced section that products are to be supplied under.
- B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:
1. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.
- C. Substitutions: Requests for substitution and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.

2.2 MATERIALS

- A. Hardware shall not have any visible manufacturer names on exposed materials, except cylinders, when the door is in a closed position.

2.3 BUTT HINGES

- A. Hinges: ANSI/BHMA A156.1 butt hinges with number of hinge knuckles and other options as specified in the Door Hardware Sets.
1. Quantity: Provide the following hinge quantity:
 - a. Two Hinges: For doors with heights up to 60 inches.
 - b. Three Hinges: For doors with heights 61 to 90 inches.
 - c. Four Hinges: For doors with heights 91 to 120 inches.

- d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
- 2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
 - a. Widths up to 3'0": 4-1/2" standard or heavy weight as specified.
 - b. Sizes from 3'1" to 4'0": 5" standard or heavy weight as specified.
- 3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:
 - a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
 - b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.
- 4. Hinge Options: Comply with the following:
 - a. Non-removable Pins: With the exception of electric through wire hinges, provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for all out-swinging lockable doors.
 - b. Provide single acting spring hinges of the type and style as specified.
 - c. Provide double acting spring hinges of the type and style as specified.
- 5. Manufacturers:
 - a. Hager Companies (HA) - BB Series, 5-knuckle.
 - b. Ives (IV) - 5BB Series, 5-knuckle.
 - c. McKinney (MK) - TA/T4A Series, 5-knuckle.

2.4 CONTINUOUS HINGES

- A. Continuous Geared Hinges: ANSI/BHMA A156.26 Grade 1-600 continuous geared hinge. with minimum 0.120-inch thick extruded 6063-T6 aluminum alloy hinge leaves and a minimum overall width of 4 inches. Hinges are non-handed, reversible and fabricated to template screw locations. Factory trim hinges to suit door height and prepare for electrical cut-outs.
 - 1. Manufacturers:.
 - a. Pemko (PE).

2.5 POWER TRANSFER DEVICES

- A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex™ standardized plug connectors and sufficient number of concealed wires (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.

1. Manufacturers:
 - a. Pemko (PE) - EL-CEPT Series.
 - b. Securitron (SU) - EL-CEPT Series.

- B. Electric Door Wire Harnesses: Provide electric/data transfer wiring harnesses with standardized plug connectors to accommodate up to twelve (12) wires. Connectors plug directly to through-door wiring harnesses for connection to electric locking devices and power supplies. Provide sufficient number and type of concealed wires to accommodate electric function of specified hardware. Provide a connector for through-door electronic locking devices and from hinge to junction box above the opening. Wire nut connections are not acceptable. Determine the length required for each electrified hardware component for the door type, size and construction, minimum of two per electrified opening.

1. Provide one each of the following tools as part of the base bid contract:
 - a. McKinney (MK) - Electrical Connecting Kit: QC-R001.
 - b. McKinney (MK) - Connector Hand Tool: QC-R003.

2. Manufacturers:
 - a. McKinney (MK) - QC-C Series.

2.6 DOOR OPERATING TRIM

- A. Flush Bolts and Surface Bolts: Provide products conforming to ANSI/BHMA A156.3 and A156.16, Grade 1.
 1. Flush bolts to be furnished with top rod of sufficient length to allow bolt retraction device location approximately six feet from the floor.
 2. Furnish dust proof strikes for bottom bolts.
 3. Surface bolts to be minimum 8" in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
 4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
 5. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).
- B. Coordinators: ANSI/BHMA A156.3 door coordinators consisting of active-leaf, hold-open lever and inactive-leaf release trigger. Model as indicated in hardware sets.
 1. Manufacturers:
 - a. Ives (IV).
 - b. Rockwood (RO).
 - c. Trimco (TC).

- C. Door Push Plates and Pulls: ANSI/BHMA A156.6 door pushes and pull units of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
 2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
 3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
 4. Pulls shall be provided with a 10" clearance from the finished floor on the push side to accommodate wheelchair accessibility.
 5. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets. When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.
 6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Ives (IV).
 - c. Rockwood (RO).

2.7 CYLINDERS AND KEYING

- A. General: Cylinder manufacturer to have minimum (10) years experience designing secured master key systems and have on record a published security keying system policy.
- B. Cylinder Types: Original manufacturer cylinders able to supply the following cylinder formats and types:
1. Threaded mortise cylinders with rings and cams to suit hardware application.
 2. Rim cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
 3. Bored or cylindrical lock cylinders with tailpieces as required to suit locks.
 4. Tubular deadlocks and other auxiliary locks.
 5. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
 6. Keyway: Manufacturer's Standard.
- C. Small Format Interchangeable Cores: Provide small format interchangeable cores (SFIC) as specified, core insert, removable by use of a special key; usable with other manufacturers' cylinders.
- D. Patented Cylinders: ANSI/BHMA A156.5, Grade 1 Certified Products Directory (CPD) listed cylinders employing a utility patented and restricted keyway requiring the use of a patented key. Cylinders are to be protected from unauthorized manufacture and distribution by manufacturer's United States patents.

1. Patented key systems shall not be established with products that have an expired patent. Expired systems shall only be specified and supplied to support existing systems.
2. Manufacturers:
 - a. Corbin Russwin (RU) - Access 3 AP.
 - b. Corbin Russwin (RU) - Pyramid.

E. Keying System: Each type of lock and cylinders to be factory keyed.

1. Supplier shall conduct a "Keying Conference" to define and document keying system instructions and requirements.
2. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
3. New System: Key locks to a new key system as directed by the Owner.

F. Key Quantity: Provide the following minimum number of keys:

1. Change Keys per Cylinder: Two (2)
2. Master Keys (per Master Key Level/Group): Five (5).
3. Construction Control Keys (where required): Two (2).
4. Permanent Control Keys (where required): Two (2).

G. Construction Keying: Provide temporary keyed construction cores.

H. Key Registration List (Bitting List):

1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Provide transcript list in writing or electronic file as directed by the Owner.

2.8 KEY CONTROL

A. Key Control Software: Provide software that offers solutions for master key system design and management, key, key ring, and item issuance, cylinder and core pinning, personal records and inventories and building, door, and floor plans. Software shall come with the option for additional services that provide custom data integration, on-site and virtual training, consulting, technical support, and custom development.

1. Key Control: System shall manage all master key systems, keys, key rings, key holders and key requests. It shall provide total key control showing outstanding keys, overdue keys (with automatic notifications), key symbols, bittings, keyways, etc. and the ability to include all systems (multiple key manufacturers supported) and buildings in one database.
2. Master Keying: Software shall provide a comprehensive master key system generator compatible with multiplex systems (key sections, keyways, angles) along with a core pinning calculator. Master keying feature shall have automatic configurable key numbering and connection with key cutting machines.
3. Facility Management: Software shall reference every building, floor, and door of your facilities while identifying the operating keys of every door and generate control reports.

4. Available options shall include.
 - a. Web Interface: Web portal option for key requests and approvals. Web users shall have restricted access, according to their privileges.
 - b. Mobile Application for Key Deliveries: Display the list of keys issued, key policy, and capture the signature in the field.
5. Manufacturers:
 - a. Medeco (MC) - Simple K.

2.9 MORTISE LOCKS AND LATCHING DEVICES

- A. Mortise Locksets, Grade 1 (Heavy Duty): Provide ANSI/BHMA A156.13, Series 1000, Operational and Security Grade 1 Certified Products Directory (CPD) listed mortise locksets. Listed manufacturers shall meet all functions and features as specified herein.
 1. Provide locksets with functions and features as follows:
 - a. Heavy duty 12-gauge wrought steel case.
 - b. Stainless steel 3/4" one-piece anti-friction reversible latchbolt with a one-piece hardened stainless steel 1" projection deadbolt.
 - c. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - d. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - e. Meets UL Certification Directory ZHLL.R21744 for products used in windstorm rated assemblies.
 - f. Status indicators inside, outside, or on both sides of doors as specified; available with wording for "locked/unlocked", "vacant/occupied" or custom wording options. Indicator to be located above the cylinder with the inside thumb-turn not blocking the visibility of the indicator status.
 - g. Ten-year limited warranty for mechanical functions.
 2. Electromechanical locksets shall have the following functions and features:
 - a. Universal Molex plug-in connectors that have standardized color-coded wiring and are available in fail safe or fail secure and operate from 12vdc to 24vdc regulated.
 - b. EcoFlex or equivalent technology that reduces energy consumption up to 92% as certified by GreenCircle.
 - c. Options to be available for request-to-exit or enter signaling, latchbolt and deadbolt monitoring.
 - d. Optional high security monitoring with internal end-of-line monitoring alongside deadbolt privacy and integrated door position monitoring.
 - e. Two-year limited warranty on electrified functions.
 3. Manufacturers:
 - a. Corbin Russwin Hardware (RU) - ML2000 Series.

- b. dormakaba BEST (BE) - 45H Series.
- c. Sargent Manufacturing (SA) - 8200 Series.

2.10 CYLINDRICAL LOCKS AND LATCHING DEVICES

- A. Cylindrical Locksets, Grade 1 (Heavy Duty): ANSI/BHMA A156.2, Series 4000, Operational Grade 1 Certified Products Directory (CPD) listed cylindrical locksets. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide locksets with functions and features as follows:

- a. Meets ANSI/BHMA A156.41 for single motion egress.
- b. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
- c. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
- d. Exceeds ANSI/BHMA A156.2 requirements by 2.6 times for 3,100 in-lb. abusive locked lever torque with no entry while maintaining egress.
- e. Exceeds ANSI/BHMA A156.2 requirements by 8 times for 1,600 lbs. offset lever pull with no entry for protection against attacks.
- f. Exceeds ANSI/BHMA A156.3 requirements by 2 times for latch retraction with 100 lb. preload while maintaining operation in warped doors.
- g. Exceeds ANSI/BHMA A156.3 requirements by 20 times for no access with minimum 100 vertical impacts for protection against vandalism attempts.
- h. Independent return springs allow lock to exceed ANSI/BHMA A156.2 Grade 1 cycle requirements without lever sag.
- i. Ten-year limited warranty for mechanical functions.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - CLX3300 Series.
- b. Sargent Manufacturing (SA) - 10X Line.
- c. Schlage (SC) - ND Series.

2.11 LOCK AND LATCH STRIKES

- A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:

- 1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
- 2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
- 3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
- 4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.

- B. Standards: Comply with the following:

1. Strikes for Mortise Locks and Latches: BHMA A156.13.
2. Strikes for Bored Locks and Latches: BHMA A156.2.
3. Strikes for Auxiliary Deadlocks: BHMA A156.36.
4. Dustproof Strikes: BHMA A156.16.

2.12 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:

1. Exit devices shall have a five-year warranty.
2. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
3. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer's catalog and template book for specific requirements.
4. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
5. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
6. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
 - a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
 - b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
7. Vertical Rod Exit Devices: Where surface or concealed vertical rod exit devices are used at interior openings, provide as less bottom rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
8. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2" wide stiles.
9. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
10. Rail Sizing: Provide exit device rails factory sized for proper door width application.
11. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 Certified Products Directory (CPD) listed exit devices. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide exit devices with functions and features as follows:

- a. Where required by code, provide knurling or abrasive coating on all levers leading to hazardous areas.
 - b. Meets UL and CUL Standard 10C Positive Pressure, Fire Test of Door Assemblies with levers that meet A117.1 Accessibility Code.
 - c. No catch points: addition of applied deflectors or other added components are not allowed.
 - d. No visible plastic.
 - e. Heavy duty end caps with flush and overlapping options made of stainless steel, brass, or bronze with architectural finishes.
 - f. Constructed of all stainless steel.
 - g. Stainless steel pullman type latch with deadlock feature.
 - h. Narrow or wide style exterior trim as specified in the hardware sets.
 - i. Ten-year limited warranty for mechanical features.
2. Manufacturers:
- a. Corbin Russwin Hardware (RU) - PED4000 / PED5000 Series.
 - b. Sargent Manufacturing (SA) - PE80 Series.
 - c. Von Duprin (VD) - 35A/98 XP Series.

2.13 SURFACE DOOR CLOSERS

- A. All door closers specified herein shall meet or exceed the following criteria:
1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers.
 2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
 3. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the Americans with Disabilities Act, provide units complying with ANSI ICC/A117.1.
 4. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
 5. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
 6. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation. Provide through-bolt and security type fasteners as specified in the hardware sets.
- B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
1. Heavy duty surface mounted door closers shall have a 30-year warranty.

2. Manufacturers:

- a. Corbin Russwin Hardware (RU) - DC6000 Series.
- b. Norton Rixson (NO) - 7500 Series.
- c. Sargent Manufacturing (SA) - 351 Series.

- C. Door Closers, Surface Mounted (Unitrol): ANSI/BHMA A156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted closers with door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

1. Manufacturers:

- a. Corbin Russwin Hardware (RU) - Unitrol Series.
- b. Norton Rixson (NO) - Unitrol Series.

- D. Door Closers, Surface Mounted (Cam Action): ANSI/BHMA 156.4, Grade 1 Certified Products Directory (CPD) listed surface mounted, high efficiency door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be of the cam and roller design, one piece cast aluminum silicon alloy body with adjustable backcheck and independently controlled valves for closing sweep and latch speed.

1. Manufacturers:

- a. Corbin Russwin (RU) - DC5000 Series.
- b. Norton Rixson (NO) - 2800ST Series.
- c. Sargent Manufacturing (SA) - 422 Series.

2.14 ELECTROMECHANICAL DOOR OPERATORS

- A. Electromechanical Door Operators (High Traffic): Provide ANSI/BHMA A156.19 Certified Products Directory (CPD) listed low energy operators that are UL325/991 and UL10C certified and comply with requirements for the Americans with Disabilities Act (ADA). Operators shall accommodate openings up to 250 pounds and 48" wide. Provide accessories such as custom templates, special mounting brackets, spacers and drop plates as needed for proper installation. Operators shall accommodate openings up to 200 pounds and 48" wide. Listed manufacturers shall meet all functions and features as specified herein.

1. Provide operators with features as follows:

- a. Non-handed with push and pull side mounting.
- b. Activation by push button, hands-free or radio frequency devices.
- c. Adjustable opening force and closing power.
- d. Two-year limited warranty.
- e. Wi-Fi interface where the operator is a secure, password protected WiFi hot spot with no connection to building's IT required.
 - 1) Simple setup with no app required.

- 2) View status and make adjustments without removing the cover.
 - 3) Built-in logic to support single use restroom applications with no external relay boards, logic modules, position switches required.
 - f. Mounting backplate to simplify and speed up installation.
 - g. Integration with access control systems.
2. Operators shall have the following functionality:
- a. Adjustable Hold Open: Amount of time a door will stay in the full open position after an activation.
 - b. Blow Open for Smoke Ventilation: Door opens when signal is received from alarm system allowing air or smoke to flow through opening. Door will stay open until signal from alarm system is stopped.
 - c. Emergency Interface Relay: Door closes and ignores any activation input until signal is discontinued.
 - d. Infinite Hold Open: Door will hold open at set position until power is turned off.
 - e. Latch Assist: At closed position, after an activation, the door is pulled in. After the door has closed, the door is pulled in to assist with latch release/engagement.
 - f. Obstruction Detection: Door closes if it hits an obstruction while opening; door will reverse to open position if it hits an obstruction while closing. Door will stop once it hits an obstruction and will rest against the obstruction until removed.
 - g. Open Delay: Delays operator opening for locking hardware.
 - h. Outside Wall Switch Disable: When contact is closed, outside wall switch is disabled.
 - i. Power Assist: Senses the door is being opened manually and applies small amount of power to assist the user in opening the door with force less than 5 lbs. The door opens only as far as it is moved manually, then closes once released.
 - j. Power Close: Additional force to assist door closing between 7° and 2°.
 - k. Presence Detector Input: Input for external sensor to detect presence at door open or close position only.
 - l. Push & Go: As the door is manually opened, the operator "senses" movement and opens door to the full-open position.
 - m. Selector Mode Switch: Off disables the signal inputs unless Blow Open is activated, on activates the signal inputs, hold open activates the unit (unless Blow Closed is activated) to the hold open position.
 - n. Vestibule Delay: When the wall switch is pressed, first door in vestibule will open. Second door will open once vestibule door delay has expired. Delay is adjustable.
 - o. Executive Mode Feature: When the door receives an activation signal it opens and remains open until either a second signal is received, or the door is manually moved in closing direction.
3. Manufacturers:
- a. dormakaba (DO) - ED100 Series.
 - b. Horton Automatics (HO) - S4100LE Series.
 - c. Norton Rixson (NO) - 6300 Series.

2.15 ARCHITECTURAL TRIM

A. Door Protective Trim

1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1" LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
3. Where plates are applied to fire rated doors with the top of the plate more than 16" above the bottom of the door, provide plates complying with NFPA 80. Consult manufacturer's catalog and template book for specific requirements for size and applications.
4. Protection Plates: ANSI/BHMA A156.6 protection plates (kick, armor, or mop), fabricated from the following:
 - a. Stainless Steel: 300 grade, 050-inch thick.
5. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.
6. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Ives (IV).
 - c. Rockwood (RO).

2.16 DOOR STOPS AND HOLDERS

- A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
- B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
 1. Manufacturers:
 - a. Hiawatha, Inc. (HI).
 - b. Ives (IV).
 - c. Rockwood (RO).
- C. Overhead Door Stops and Holders: ANSI/BHMA A156.8, Grade 1 Certified Products Directory (CPD) listed overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

1. Manufacturers:
 - a. Norton Rixson (RF).
 - b. Rockwood (RO).
 - c. Sargent Manufacturing (SA).

2.17 ARCHITECTURAL SEALS

- A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
- B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
 1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
- C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
 1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and NFPA 252, Standard Methods of Fire Tests of Door Assemblies.
- D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
- E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.
- F. Manufacturers:
 1. National Guard Products (NG).
 2. Pemko (PE).
 3. Reese Enterprises, Inc. (RE).

2.18 ELECTRONIC ACCESSORIES

- A. Intelligent Switching Power Supplies: Provide the least number of power supplies at the appropriate amperage level sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
 1. Power supplies shall meet all functions and features as specified herein.
 - a. UL listed dual voltage 12 or 24 VDC field selectable continuous output.

- b. Dedicated fast charger to prolong battery life with low battery cutoff to protect batteries from deep discharge.
- c. Enhanced surge immunity for input/output protection
- d. Separate, dedicated battery charging circuit to keep locks cooler.
- e. Dual-color LED visual notification to prevent applying incorrect voltages to the power supply.
- f. Instant auto-switch to battery on AC loss.
- g. Expandable up to 16 outputs in the standard enclosure
- h. Integrated fire alarm interface to allow main output shutdown or disconnect on a per output basis when using an R8 output module.
- i. Network ready and remotely manage locks and connected devices when using an M8 managed output module on network models.
- j. Lifetime replacement, no-fault, no questions asked warranty.

2. Manufacturers:

- a. Life Safety Power (LP).
- b. Securitron (SU) - AQL Series.

2.19 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.20 FINISHES

- A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
- B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware
- C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- D. Sublimation Finishes: Where specified, provide scratch resistant sublimation finishes that use heat and pressure to transfer high-quality, durable patterns and colors onto powder coated surfaces creating realistic finishes like wood and marble.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

- A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
- B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

- A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
 - 1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
- B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
 - 1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
 - 2. DHI TDH-007-20: Installation Guide for Doors and Hardware.
 - 3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
 - 4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.
- C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
- D. Push Plates and Door Pulls: When through-bolt fasteners are in the same location as a push plate, countersink the fasteners flush with the door face allowing the push plate to sit flat against the door.

- E. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
- F. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

- A. Field Inspection (Punch Report): Reference Division 01 Sections "Closeout Procedures". Produce project punch report for each installed door opening indicating compliance with approved submittals and verification hardware is properly installed, operating and adjusted. Include list of items to be completed and corrected, indicating the reasons or deficiencies causing the Work to be incomplete or rejected.
 - 1. Organization of List: Include separate Door Opening and Deficiencies and Corrective Action Lists organized by Mark, Opening Remarks and Comments, and related Opening Images and Video Recordings.

3.5 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

- A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
- B. Clean adjacent surfaces soiled by door hardware installation.
- C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

- A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SETS

- A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with

corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.
2. The supplier is responsible for handing and sizing all products.
3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.
4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Refer to Section 080671, Door Hardware Sets, for hardware sets.

END OF SECTION 087100

SECTION 08 71 13 - POWER DOOR OPERATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Power door operators for swinging doors.
2. Low-energy door operators for swinging doors.
3. Power-assist door operators for swinging doors.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for installing recessed metal frames for control mats in concrete.
2. Section 084229.33 "Swinging Automatic Entrances" for swinging doors and frames packaged with power door operators.

1.2 DEFINITIONS

- A. AAADM: American Association of Automatic Door Manufacturers.
- B. Activation Device: A control that, when actuated, sends an electrical signal to the door operator to open the door.
- C. Double-Egress (Doors): A pair of doors that simultaneously swing, with the two doors moving in opposite directions with no mullion between them.
- D. Double-Swing (Doors): A pair of doors that swing, with the two doors moving in opposite directions with a mullion between them; each door functioning as a single-swing door.
- E. Safety Device: A control that, to avoid injury, prevents a door from opening or closing.
- F. For automatic door terminology, see [BHMA A156.10][and][BHMA A156.19] for definitions of terms.

1.3 COORDINATION

- A. Coordinate sizes and locations of recesses in concrete floors for recessed control mats that control power door operators. Concrete, reinforcement, and formwork requirements are specified elsewhere.
- B. Templates: Distribute for doors, frames, and other work specified to be factory prepared and reinforced for installing power door operators.

- C. Coordinate hardware for doors with operators to ensure proper size, thickness, hand, function, and finish.
- D. Electrical System Roughing-in: Coordinate layout and installation of power door operators with connections to the following:
 - 1. Power supplies.
 - 2. Access-control system.
 - 3. Remote activation devices.
 - 4. Remote monitoring systems.
- E. Pneumatic System Roughing-in: Coordinate layout and installation of power door operators and power units with compressed-air piping.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for power door operators.
 - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
- B. Shop Drawings: For power door operators.
 - 1. Include plans, elevations, sections, hardware mounting heights, and attachment details.
 - 2. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Indicate locations of activation and safety devices.
 - 4. Include diagrams for power, signal, and control wiring.
 - 5. Include plans, elevations, sections, and attachment details for guide rails.
- C. Samples: For each exposed product and for each color and texture specified, [manufacturer's standard size]<Insert dimensions>.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][Certified Inspector].
- B. Product Certificates: For each type of power door operator.[For each operator for fire-rated door assemblies, certify that operator is listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for use on types and sizes of labeled fire doors required.]

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

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For power door operators, safety devices, and control systems, to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer for installation and maintenance of units required for this Project[and who employs a Certified Inspector].
 - 1. Maintenance Proximity: Not more than [two]<Insert number> hours' normal travel time from Installer's place of business to Project site.
- B. Certified Inspector Qualifications: Certified by AAADM.

1.9 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of power door operators that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Faulty or sporadic operation of power door operator, including controls.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering or use.
 - 2. Warranty Period: [Two]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 POWER DOOR OPERATORS, GENERAL

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [ASSA ABLOY Entrance Systems; ASSA ABLOY]
 - 2. [Ditec; Entrematic; ASSA ABLOY]
 - 3. [Door Motion Technologies, Inc.]
 - 4. [dormakaba USA Inc.]

5. [Falcon; Allegion plc]
 6. [Hager Companies]
 7. [Horton Automatics; Overhead Door Corporation]
 8. [KM Systems, Inc]
 9. [LCN; Allegion plc]
 10. [NABCO Entrances, Inc]
 11. [Record USA; ASSA ABLOY]
 12. [SARGENT Manufacturing Company; ASSA ABLOY]
 13. [STANLEY Access Technologies LLC; STANLEY Security Solutions, Inc.]
 14. <Insert manufacturer's name>
- B. Source Limitations: Obtain power door operators, including activation and safety devices, from [single source from single manufacturer.][same manufacturer as for hardware in Section 087100 "Door Hardware."][same manufacturer as for hardware in Section 087111 "Door Hardware (Descriptive Specification)."]
- C. General: Provide operators of size recommended by manufacturer for door size, weight, and movement; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated; and in accordance with UL 325. Coordinate operator mechanisms with door operation, hinges, and activation and safety devices.
1. Emergency Breakaway: Where indicated for center-pivoted doors, provide emergency breakaway feature for reverse swing of doors. Equip system to discontinue power to power door operator when door is in emergency breakaway position, to return door to closed position after breakaway, and to automatically reset.
 2. Fire-Rated Doors: Provide door operators for fire-rated door assemblies that comply with NFPA 80 for fire-rated door components and are listed and labeled by a qualified testing agency.
 3. Wind Load: Provide door operators on exterior doors that will open and close doors and maintain them in fully closed position when subjected to wind load of <Insert wind load>.
- D. Electromechanical Operating System: Self-contained unit powered by permanent-magnet dc motor; with closing speed controlled mechanically by gear train and dynamically by braking action of electric motor, connections for power and activation- and safety-device wiring, and manual operation, including spring closing when power is off.
- E. Electrohydraulic Operating System: Self-contained, low-pressure unit; with separate cylinders for power and checking, connections for power and activation- and safety-device wiring, and manual operation, including spring closing when power is off.
- F. Pneumatic Operating System: Pneumatic operator, air opened and spring closed; with checking in both cycles and manual operation when power is off.
1. Power Unit:
 - a. Control box and compressor unit, complete with tank, compressor, air line to operator, motor, regulator, safety valve, pressure cutoff switch, and

- automatic air-line filter drain.
 - b. Remote-control box powered by compressed-air system specified in Section 221513 "General-Service Compressed-Air Piping" and Section 221519 "General-Service Packaged Air Compressors and Receivers."
- G. Hinges: See [Section 087100 "Door Hardware"] [Section 087111 "Door Hardware (Descriptive Specification)"] for hinge type for each door that door operator shall accommodate.
- H. Housing for Overhead Concealed Operators: Fabricated from minimum 0.125-inch- thick, extruded or formed aluminum and extending full width of door opening, including door jambs, 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.
- I. Cover for Surface-Mounted Operators: Fabricated from 0.125-inch- thick, extruded or formed aluminum[; manufacturer's standard width][; continuous over full width of operator-controlled door opening][; continuous over full width of door opening, including door jambs]; with enclosed end caps, provision for maintenance access, and fasteners concealed when door is in closed position.
- J. Brackets and Reinforcements: Fabricated from aluminum with nonstaining, nonferrous shims for aligning system components.
- K. Fire-Door Package: Consisting of UL-listed latch mechanism, power-reset box, and caution signage for fire-rated doors. Latch mechanism shall allow door to swing free during automatic operation; when fire is detected, latch actuator shall cause exit hardware to latch when door closes. Provide latch actuators with fail-secure design.
- L. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 POWER DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.10.
- B. Performance Requirements:
 - 1. Opening Force:
 - a. Power-Operated Doors: Not more than 50 lbf required to manually set door in motion if power fails; not more than 15 lbf required to open door to minimum required width.
 - b. Power-Operated Swinging Doors: Not more than 30 lbf required to manually open door if power fails.
 - c. Breakaway Device for Power-Operated Doors: Not more than 50 lbf required for breakaway door or panel to open.
 - 2. Entrapment-Prevention Force: Not more than 40 lbf required to prevent stopped

door in the last 10 degrees of opening from moving in the direction of opening; not more than 30 lbf required to prevent stopped door from moving in direction of closing.

- C. Configuration: Operator to control [single swinging door][pair of swinging doors].
 - 1. Traffic Pattern: [One way][Two way][Double swing][Double egress].
 - 2. Operator Mounting: [Surface][Overhead concealed].
- D. Operation: Power opening and[power-assisted] spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.10.
- E. Operating System: [Electromechanical][Electrohydraulic][Pneumatic].
- F. Microprocessor Control Unit: Solid-state controller.
- G. Features:
 - 1. Adjustable [opening][and][closing] speed.
 - 2. Adjustable [opening][and][closing] force.
 - 3. Adjustable backcheck.
 - 4. Adjustable hold-open time from zero to 30 seconds.
 - 5. Adjustable time delay.
 - 6. Adjustable acceleration.
 - 7. Adjustable limit switch.
 - 8. Obstruction recycle.
 - 9. Power door re-open if stopped while closing.
 - 10. On-off/hold-open switch to control electric power to operator[; key operated].
 - 11. <Insert feature>.
- H. Controls: Activation and safety devices [as indicated on Drawings and]in accordance with BHMA standards.
 - 1. Activation Device, Motion Sensor: Mounted on ingress side of door header to detect pedestrians in activating zone and to open door.
 - 2. Activation Device, Control Mat: Installed on ingress side of door to detect pedestrians in activating zone and to open door.
 - 3. Activation Device, Switch: [Push-plate switch][Touchless switch][Push-button switch][Key switch][on each side of door]to activate door operator.
 - 4. Safety Device, Presence Sensor: Mounted on [door header][horizontal door muntin][guide rail] to detect pedestrians in presence zone and to prevent door from closing.
 - 5. Safety Device, Photoelectric Beam: One photoelectric beam mounted in guide rails to detect pedestrians in presence zone and to prevent door from closing.
 - 6. Safety Device, Control Mat(s): Installed on egress side of door to detect pedestrians in presence and safety zones and to prevent door from closing.
- I. Exposed Finish: [Class I, clear anodic finish][Class II, clear anodic finish][Class I, color anodic finish][Class II, color anodic finish][Baked-enamel or powder-coat finish][Metal cladding][Finish matching door and frame][Finish matching door hardware]<Insert finish>.

1. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
2. Metal Cladding: [No. 4, directional-satin-finish stainless steel][No. 8, mirrorlike-reflective, nondirectional-polish-finish stainless steel][Satin brass][Polished brass][Satin bronze][Polished bronze]<Insert finish>.

2.3 LOW-ENERGY DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
 1. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
 2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration, Single: Operator to control single swinging door.
 1. Traffic Pattern: [One][Two] way.
 2. Operator Mounting: [Surface][Overhead concealed].
- D. Configuration, Pair: Operator to control pair of swinging doors.
 1. Traffic Pattern: [One way][Two way][Double egress][Double swing].
 2. Operator Mounting: [Surface][Overhead concealed].
- E. Operation: Power opening and[power-assisted] spring closing. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- F. Operating System: [Electromechanical][Electrohydraulic][Pneumatic].
- G. Microprocessor Control Unit: Solid-state controller.
- H. Features:
 1. Adjustable [opening][and][closing] speed.
 2. Adjustable [opening][and][closing] force.
 3. Adjustable backcheck.
 4. Adjustable hold-open time from zero to 30 seconds.
 5. Adjustable time delay.
 6. Adjustable acceleration.
 7. Obstruction recycle.
 8. On-off/hold-open switch to control electric power to operator[; key operated].
 9. <Insert feature>.

- I. Activation Device: [Push-plate switch][Touchless switch][Push-button switch][Key switch][on each side of door] to activate door operator.
- J. Exposed Finish: [Class I, clear anodic finish][Class II, clear anodic finish][Class I, color anodic finish][Class II, color anodic finish][Baked-enamel or powder-coat finish][Metal cladding][Finish matching door and frame][Finish matching door hardware]<Insert finish>.
 - 1. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
 - 2. Metal Cladding: [No. 4, directional-satin-finish stainless steel][No. 8, mirrorlike-reflective, nondirectional-polish-finish stainless steel][Satin brass][Polished brass][Satin bronze][Polished bronze]<Insert finish>.

2.4 POWER-ASSIST DOOR OPERATORS FOR SWINGING DOORS

- A. Standard: BHMA A156.19.
- B. Performance Requirements:
 - 1. Opening Force:
 - a. Opening Force if Power Fails: Not more than 15 lbf required to release latch if provided, not more than 30 lbf required to manually set door in motion, and not more than 15 lbf required to fully open door.
 - b. Accessible Interior Doors: Not more than 5 lbf to push or pull door to fully open position.
 - 2. Entrapment-Prevention Force: Not more than 15 lbf required to prevent stopped door from closing or opening.
- C. Configuration, Single: Operator to control single swinging door.
 - 1. Traffic Pattern: [One][Two] way.
 - 2. Operator Mounting: [Surface][Overhead concealed].
- D. Configuration, Pair: Operator to control pair of swinging doors.
 - 1. Traffic Pattern: [One way][Two way][Double egress][Double swing].
 - 2. Operator Mounting: [Surface][Overhead concealed].
- E. Operation: Power-assisted opening that reduces the force to open door and[power-assisted] spring closing. Pushing or pulling on door activates operator. Provide time delay for door to remain open before initiating closing cycle as required by BHMA A156.19. When not in automatic mode, door operator shall function as manual door closer, with or without electrical power.
- F. Operating System: [Electromechanical][Electrohydraulic][Pneumatic].
- G. Microprocessor Control Unit: Solid-state controller.

H. Features:

1. Adjustable [opening][and][closing] speed.
2. Adjustable [opening][and][closing] force.
3. Adjustable backcheck.
4. Adjustable hold-open time from zero to 30 seconds.
5. Adjustable time delay.
6. Adjustable acceleration.
7. Obstruction recycle.
8. On-off/hold-open switch to control electric power to operator[; key operated].
9. <Insert feature>.

I. Exposed Finish: [Class I, clear anodic finish][Class II, clear anodic finish][Class I, color anodic finish][Class II, color anodic finish][Baked-enamel or powder-coat finish][Metal cladding][Finish matching door and frame][Finish matching door hardware]<Insert finish>.

1. Color: [Light bronze][Medium bronze][Dark bronze][Black][As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
2. Metal Cladding: [No. 4, directional-satin-finish stainless steel][No. 8, mirrorlike-reflective, nondirectional-polish-finish stainless steel][Satin brass][Polished brass][Satin bronze][Polished bronze]<Insert finish>.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
1. Extrusions: ASTM B221.
 2. Sheet: ASTM B209.
- B. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304]<Insert alloy type>, stretcher-leveled standard of flatness, in manufacturer's standard thickness.
- C. Brass Sheet: ASTM B36/B36M, Alloy UNS No. C26000 (cartridge brass, 70 percent copper), in manufacturer's standard thickness.
- D. Bronze Sheet: ASTM B36/B36M, Alloy UNS No. C28000 (muntz metal, 60 percent copper) or Alloy UNS No. C23000 (red brass, 85 percent copper), in manufacturer's standard thickness.
- E. Expanded Aluminum Mesh: [Expanded][Expanded and flattened] aluminum sheet in accordance with the geometry of ASTM F1267.
- F. Polycarbonate Sheet: ASTM C1349, Appendix X1, Type II, coated, mar-resistant, UV-stabilized polycarbonate with coating on both surfaces.
- G. Fasteners and Accessories: Corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

2.6 CONTROLS

- A. General: Provide controls, including activation and safety devices, in accordance with BHMA standards; for condition of exposure; and for long-term, maintenance-free operation under normal traffic load for occupancy type indicated. Coordinate activation and safety devices with door operation and door operator mechanisms.
- B. Motion Sensors: Self-contained, K-band-frequency, microwave-scanner units; fully enclosed in plastic housing; adjustable to provide detection field sizes and functions required by BHMA A156.10.
 - 1. Provide capability for switching between bidirectional and unidirectional detection.
 - 2. For one-way traffic, sensor on egress side shall not be active when doors are fully closed.
- C. Presence Sensors: Self-contained, active-infrared scanner units; adjustable to provide detection field sizes and functions required by BHMA A156.10. Sensors shall remain active at all times.
- D. Photoelectric Beams: Pulsed infrared, sender-receiver assembly for recessed mounting. Beams shall not be active when doors are fully closed.
- E. Control Mats: 1/2-inch- thick, synthetic-rubber or flexible-plastic mat in safety-ribbed surface pattern, with extruded-aluminum frame; with pressure switches for low-voltage control wiring; and in accordance with performance requirements in BHMA A156.10.
 - 1. Frame: [Recessed to fit flush with floor, with concealed anchors][Surface mounted, with tapered safety edge].
 - 2. Size: As indicated, but not smaller than required by BHMA A156.10, including Appendix A.
 - 3. Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
- F. Push-Plate Switch: Momentary-contact door control switch with flat push-plate actuator[with contrasting-colored, engraved message].
 - 1. Configuration:
 - a. Round or Square Push Plate: 4-by-4-inch junction box.
 - 1) Mounting: [As indicated on Drawings][Recess mounted, semiflush in wall][Surface mounted on wall].
 - b. Rectangular Push Plate: 2-by-4-inch junction box.
 - 1) Mounting: [As indicated on Drawings][Recess mounted, semiflush in wall][Recess mounted in door jamb][Surface mounted on wall][Surface mounted on post][Surface mounted on guide rail].

2. Push-Plate Material: [Stainless steel][Plastic] as selected by Architect from manufacturer's full range.
 3. Message: [Plain face with no message.]["Push to Open."]["International symbol of accessibility."]["International symbol of accessibility and "Push to Open."]
- G. Touchless Switch: Hands-free activation door-control switch with flat motion sensor face-plate[with contrasting-colored, engraved message].
1. Configuration: [6-inch round][4.56-by-4.56-inch (double gang) square][2.77-by-4.56-inch (single gang) rectangular][1.68-by-4.56-inch jamb-style] face plate.
 - a. Mounting: [As indicated on Drawings][Recess mounted in wall][Recess mounted in door jamb][Surface mounted on wall].
 2. Face-Plate Material: [Stainless steel][Plastic][Stainless steel with backlight acrylic window][As selected by Architect from manufacturer's full range of options].
 3. Message: ["Wave to Open."]["Wave to Open" and wave symbol.]["International symbol of accessibility."]["International symbol of accessibility and "Wave to Open" and wave symbol.]
- H. Push-Button Switch: Momentary-contact door control switch with one red-button actuator; enclosed in nominal [2-by-4-inch][4-by-4-inch] junction box.
1. Provide faceplate engraved with "Press to Open" text[and international symbol of accessibility] in contrasting color.
 2. Provide blue plastic cover engraved with "Press Button to Open" in white text and with international symbol of accessibility.
 3. Mounting: [As indicated on Drawings][Surface mounted on wall][Surface mounted on post][Surface mounted on guide rail][Recess mounted in wall].
 4. Faceplate Material: [Stainless steel][Painted metal] as selected by Architect from manufacturer's full range.
- I. Key Switch: Recess-mounted, door control switch with key-controlled actuator; enclosed in 2-by-4-inch junction box. Provide faceplate engraved with text indicating switch functions.
1. Faceplate Material: [Stainless steel][Painted metal] as selected by Architect from manufacturer's full range.
 2. Functions: [On-off, momentary contact][On-off, maintained contact][Two-way automatic, hold open, one-way exit, and off][Two-way automatic, hold open, one-way exit, off, full open, and partial open].
 3. Mounting: [As indicated on Drawings][Recess mounted, semiflush in wall][Recess mounted in door jamb][Surface mounted on wall][Surface mounted on post].
- J. Wireless or Remote Radio-Control Switch: Radio-control system consisting of header-mounted receiver and [wall-mounted][handheld, battery-operated] transmitter switch.
1. Wall-Mounted Transmitter Switch: One red-button, momentary-contact actuator enclosed in 4-by-4-inch junction box. Provide blue plastic cover engraved with "Press Button to Open" in white text and with international symbol of

accessibility.

- K. 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.

2.7 ACCESSORIES

- A. Signage: As required by cited BHMA standard for type of door and its operation.
 - 1. Application Process: [Decals][Silk-screened][Operator manufacturer's standard process]<Insert requirement>.
 - 2. Provide sign materials with instructions for field application when operators are installed.
- B. Guide Rails:
 - 1. [Anodized aluminum][Baked-enamel or powder-coated aluminum][Stainless steel], fabricated from [bars][or][tubing], minimum 30 inches high, and finished to match doors unless otherwise indicated; 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]<Insert requirement>; with filler panel.
 - a. Filler Panel: [Expanded aluminum mesh][Clear polycarbonate sheet][Colored polycarbonate sheet]<Insert material>.
 - 1) Orient expanded aluminum mesh with long dimension of diamonds [parallel][perpendicular] to top rail.
 - 2) Color: [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 - b. Provide intermediate guide rail suitable for supporting photoelectric beams.
 - c. Mounting: [As indicated on Drawings][Jamb and floor][Floor, freestanding].
 - d. Aluminum Finish: [Class I, clear anodic finish][Class II, clear anodic finish][Class I, color anodic finish][Class II, color anodic finish][Baked-enamel or powder-coat finish][Finish matching door and frame]<Insert finish>.
 - 1) Color: [Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
 - e. Stainless Steel Finish: [No. 4, directional-satin-finish stainless steel][Finish matching door and frame]<Insert finish>.
 - 2. See [Section 055213 "Pipe and Tube Railings."][Section 057300 "Decorative Metal Railings."]

2.8 FABRICATION

- A. Factory fabricate power door operators to comply with indicated standards.
- B. Form aluminum shapes before finishing.
- C. Fabricate exterior components to drain condensation and water-passing joints within operator enclosure to the exterior.
- D. Use concealed fasteners to greatest extent possible. Where exposed fasteners are required, use countersunk Phillips flat-head machine screws, finished to match operator.
- E. Provide metal cladding, completely covering visible surfaces before shipment to Project site. Fabricate cladding with concealed fasteners and connection devices, with accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion, and with allowance for thermal expansion at exterior doors.

2.9 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying strippable, temporary, protective covering before shipping.
- B. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.
- C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within range of approved Samples and are assembled or installed to minimize contrast.

2.10 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
- B. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances, door and frame preparation and reinforcements, and other

conditions affecting performance of power door operators.

- B. Examine roughing-in for electrical systems to verify actual locations of power connections before power door operator installation.
- C. Examine roughing-in for compressed-air piping systems to verify actual locations of piping connections before power door operator installation.
- D. Verify that full-height finger guards are installed at each door with pivot hinges, where door has a clearance at hinge side greater than 1/4 inch and less than 3/4 inch with door in any position.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install power door operators in accordance with manufacturer's written instructions and cited BHMA standard for type of door operation and direction of pedestrian travel, including signage, controls, wiring, remote power units if any, and connection to building's power supply.
 - 1. Do not install damaged components. Fit joints to produce hairline joints free of burrs and distortion.
 - 2. Install operators true in alignment with established lines and door geometry without warp or rack. Anchor securely in place.
- B. Controls: Install activation and safety devices in accordance with manufacturer's written instructions and cited BHMA standard for operator type and direction of pedestrian travel. Connect control wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Access-Control System: Connect operators to access-control system as specified in Section 281500 "Access Control Hardware Devices."
- D. Signage: Apply on both sides of each door as required by cited BHMA standard for type of door operator and direction of pedestrian travel.
- E. Guide Rails: Install in accordance with BHMA A156.10, including Appendix A and manufacturer's written instructions unless otherwise indicated.

3.3 FIELD QUALITY CONTROL

- A. Certified Inspector: [Owner will engage][Engage] a Certified Inspector to test and inspect components, assemblies, and installations, including connections.
- B. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:
 - 1. Test and inspect each power door operator installation, using AAADM inspection forms, to determine compliance of installed systems with applicable BHMA

standards.

- C. Power door operators will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.4 ADJUSTING

- A. Adjust power door operators to function smoothly, and lubricate as recommended by manufacturer; comply with requirements of applicable BHMA standards.
 - 1. Adjust operators on exterior doors for tight closure.
- B. After completing installation of power door operators, inspect exposed finishes on doors and operators. Repair damaged finish to match original finish.
- C. Readjust power door operators and controls after repeated operation of completed installation equivalent to three days' use by normal traffic (100 to 300 cycles).
- D. Occupancy Adjustment: When requested within [12]<Insert number> months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to [two]<Insert number> visits to Project during other-than-normal occupancy hours for this purpose.

3.5 MAINTENANCE SERVICE

- A. Initial Maintenance Service: Beginning at Substantial Completion, maintenance service shall include [three][six][nine][12] months' full maintenance by skilled employees of power door operator Installer. Include [monthly][quarterly] preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper door operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 1. Engage a Certified Inspector to perform safety inspection after each adjustment or repair and at end of maintenance period. Furnish completed inspection reports to Owner.
 - 2. Perform maintenance, including emergency callback service, during normal working hours.
 - 3. Include 24-hour-per-day, seven-day-per-week, emergency callback service.

3.6 DEMONSTRATION

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

END OF SECTION 08 71 13

SECTION 08 8000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Window units.
 - 2. Vision lites.
 - 3. Entrances and other doors.
 - 4. Storefront construction.
- B. Related Sections: The following sections contain requirements that relate to this Section.
 - 1. Division 8 Sections: "Doors..., Entrances..., Windows".

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. IBC: International Building Code.
- D. Interspace: Space between lites of an insulating-glass unit.
- E. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's directions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated glass standard.
- F. Deterioration of Insulating Glass: Failure of the hermetic seal under normal use due to causes other than glass breakage and improper practices for maintaining, and cleaning insulating glass. Evidence of failure is the obstruction of vision by dust, moisture, or film on the interior surfaces of glass. Improper practices for maintaining and cleaning glass do not comply with the manufacturer's directions.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.
- B. Delegated Design: Glass thickness designations indicated are minimums and are for detailing only. Provide glass, complying with specified performance criteria and including comprehensive engineering analysis of strength according to ASTM E 1300, by a qualified professional engineer. The design shall consider all load cases and load case combinations.
 - I. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:
 - a. Specified Design Wind Loads: as required by code for building location.
 - b. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in **miles per hour** at **33 feet** above grade, according to ASCE 7, "Minimum Design Loads for Buildings and Other Structures": Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.
 - 1) Basic Wind Speed: As required by code for building location.
 - 2) Importance Factor: As required by code for building location.
 - 3) Exposure Category: As required by code for building location.
 - c. Probability of Breakage for Vertical Glazing: 8 lites per 1000 for lites set vertically or not more than 15 degrees off vertical and under wind action.
 - I) Load Duration: 60 seconds or less.
 - d. Maximum Lateral Deflection: For the following types of glass supported on all 4 edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or **1 inch**, whichever is less, and keeps glazing retained in place with a suitable margin of safety under all design conditions. Additionally, limit the deflection of overhead glazing as necessary to prevent ponding.
 - I) For monolithic-glass lites heat treated to resist wind loads.
 - e. Minimum Glass Thickness for Exterior Lites: Not less than size indicated on drawings.
- B. Thermal Stress: Specify the glazing, under all design conditions, to resist thermal stress breakage.

- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
 - 1. Temperature Change (Range): 120 F deg, ambient; 180 F deg, material surfaces.
- D. Safety Glazing: Provide safety glazing where required by code. Where safety glazing is indicated, provide glazing that complies with 16 CFR 1201, Category II.
- E. Thermal and Optical Performance Properties: Provide glass with performance properties specified based on manufacturer's published test data, as determined according to procedures indicated below:
 - 1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
 - 2. For insulating glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 - 3. Center-of-Glass Values: Based on the most current non-beta version of LBL's WINDOW computer program for the following methodologies:
 - a. U-Factors: NFRC 100 expressed as Btu/ sq. ft. x h x deg F .
 - b. Solar Heat Gain Coefficient: NFRC 200.
 - c. Solar Optical Properties: NFRC 300.
- F. Alternate manufacturers are acceptable, in accordance with substitution procedures, provided they can meet the above criteria and any requirements in 01-2500.

1.5 SUBMITTALS

- A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.
- B. Product Data: For each glass product and glazing material indicated.
- C. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.
- D. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
 - 1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

- E. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.
- F. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.
- G. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.6 QUALITY ASSURANCE

- A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where 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: "Laminated Glazing Reference Manual" and "Glazing Manual."
 - 2. FGIA Publication for Insulating Glass: IGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial & Residential Use."
- B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
 - 1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.
- C. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
 - 1. Insulating Glass Certification Council (IGCC).
 - 2. Associated Laboratories, Inc. (ALI).
 - 3. National Certified Testing Laboratories (NCTL).
- D. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.
- E. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:
 - 1. Primary glass of each (ASTM C 1036) type and class indicated.
 - 2. Laminated glass of each (ASTM C 1172) kind indicated.
 - 3. Insulating glass of each construction indicated.

- F. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
 - 1. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing materials manufacturer or when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Install liquid sealants at ambient and substrate temperatures above 40 deg F.

1.9 WARRANTY

- A. General: Warranties specified in this Article shall not deprive the User of other rights the User may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.
- B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - a. Warranty Period: 10 years from date of Substantial Completion.
- C. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.
 - a. Warranty Period: 10 years from date of Substantial Completion.

- D. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - a. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products that meet the listed qualifications but are not limited to, the products specified in Glazing Schedule at end of this Section.
 - 1. Basis-of-Design Product: Guardian® Glass, LLC.
 - 2. Or equal substitutions will be considered when submitted in accordance with Substitution Specification.
- D. Source Limitations for Glass: Obtain from single source from single manufacturer for each glass type.
 - 1. Obtain reflective-coated glass from single source from single manufacturer.
- E. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

2.2 GLASS PRODUCTS

- A. Clear Annealed Float Glass: ASTM C 1036, Type I, Quality-Q3 , Class 1 (clear) unless otherwise indicated.
- B. Fully Tempered Float Glass: Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
 - 1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion horizontally oriented upon installation, unless approved in advance in writing by the project architect.
- C. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

3. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion horizontally oriented upon installation, unless approved in advance in writing by the project architect.
- D. Ceramic or Silicone Coated Spandrel Glass: ASTM C 1048, Type I, Condition B, Quality-Q3.
- E. Refer to coated glass product requirements for performance characteristics of coated tinted glass for monolithic glazing relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.
- F. Refer to requirements for sealed insulating glass units for performance characteristics of assembled units composed of coated or uncoated glass, relative to visible light transmittance, U-values, shading coefficient, and visible reflectance.

2.3 INSULATING GLASS PRODUCTS

- A. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements indicated, including those in Insulating Glass Product Data Sheet at the end of this Section.
 1. For properties of individual glass lites making up units, refer to requirements specified elsewhere in this Section applicable to types, classes, kinds, and conditions of glass products comprising lites of insulating glass units.
 2. Provide coated float glass of kind indicated and Kind FT (fully tempered) where safety glass is designated or required.
 3. Performance characteristics designated for coated insulating glass are nominal values based on manufacturer's published test data for units with lites 6 mm thick and nominal 1/2-inch dehydrated space between lites, unless otherwise indicated.
 4. U-values are expressed as Btu/hr x sq. ft. x deg F.

2.4 ELASTOMERIC GLAZING SEALANTS

- A. General: Provide products of type indicated, complying with the following requirements:
 1. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials they will contact, including glass products, seals of insulating glass units, and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience.
 2. Suitability: Comply with sealant and glass manufacturer's recommendations for selecting glazing sealants and tapes that are suitable for applications indicated and conditions existing at time of installation.
 3. Colors: Provide color of exposed joint sealants to comply with the following:
 - a. Provide selections made by Professional from manufacturer's full range of standard colors for products of type indicated.

- B. Elastomeric Glazing Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that comply with ASTM C 920 requirements indicated on each Elastomeric Glazing Sealant Product Data Sheet at the end of this Section, including those referencing ASTM classifications for Type, Grade, Class and Uses.
 - 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Glazing Sealant Product Data Sheet, provide products, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, with the capability to withstand the specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for uses indicated.

2.5 GLAZING TAPES

- A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800.
- B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.
- C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
 - 1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
 - a. PTI 303 Glazing Tape (shimless), Protective Treatments, Inc.
 - b. Tremco 440 Tape, Tremco Inc.
 - c. Extru-Seal, Pecora Corp.
 - d. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
 - e. Dyna-Seal, Pecora Corp.
 - f. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
 - g. SST-800 Tape, Tremco, Inc.
 - 2. Back-Bedding Mastic Glazing Tape With Spacer Rod:
 - a. PTI 303 Glazing Tape (with shim), Protective Treatments, Inc.
 - b. Pre-shimmed Tremco 440 Tape, Tremco, Inc.
 - c. PTI 606 Architectural Sealant Tape, Protective Treatments, Inc.
 - 3. Expanded Cellular Glazing Tape:
 - a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.6 GLAZING GASKETS

- A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.
- B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene, ASTM C 864.
 - 2. EPDM, ASTM C 864.
 - 3. Silicone, ASTM C 1115.
 - 4. Thermoplastic polyolefin rubber, ASTM C 1115.
 - 5. Any material indicated above.
- C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
 - 1. Neoprene.
 - 2. EPDM.
 - 3. Silicone.
 - 4. Thermoplastic polyolefin rubber.
 - 5. Any material indicated above.
- D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.
 - 1. Lock-Strip Gaskets:
 - a. Stanlock Div., Griffith Rubber Mills.
 - 2. Preformed Gaskets:
 - a. Advanced Elastomer Systems, L.P.
 - b. Schnee-Morehead, Inc.
 - c. Tremco, Inc.

2.7 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 involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).
- F. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.8 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 recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine glass framing, with glazier present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, 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. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING, GENERAL

- A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

- B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.
- C. Protect glass from edge damage during handling and installation as follows:
 - 1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
 - 2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.
- E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass sizes larger than 50 united inches (length plus height) as follows:
 - 1. Locate spacers inside, outside, and directly opposite each other. Install correct size and spacing to preserve required face clearances, except where gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking to comply with requirements of referenced glazing publications, unless otherwise required by glass manufacturer.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- K. Square cut wedge-shaped gaskets at corners and install gaskets in manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

- A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.
- C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.
- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Do not remove release paper from tape until just before each lite is installed.
- F. Apply heel bead of elastomeric sealant.
- G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 GASKET GLAZING (DRY)

- A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.
- B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- C. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

- A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.
- B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.
- C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.7 LOCK-STRIP GASKET GLAZING

- A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.8 PROTECTION AND CLEANING

- A. Protect exterior glass from breakage 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 including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.
- E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

PART 4 – GLASS SCHEDULE

4.1 MONOLITHIC GLASS SCHEDULE

- A. Glass Type G-X: 1/4-inch clear, tempered (safety) glass for Storefront Interior windows and interior doors. Provide 9/16" glass at railing applications as required to meet safety requirements.
- B. 45 min Fire Rated Glass: Tempered (safety) glass, for fire-rated glass for rated doors.

4.2 INSULATED GLASS SCHEDULE

- C. **Glass Type IG-1:** Low-E Coated, Clear Insulating Vision Glass.
 - 1. Basis-of-Design Product: Guardian Glass LLC; SunGuard SN 68 on Clear.
 - 2. Overall Unit Thickness: 1 inch (25 mm).
 - 3. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
 - 4. Outboard Lite: Guardian Clear Float Glass.
 - a. Coating Sputtered on Surface #2: Guardian SunGuard SN 68.

- b. Heat Treatment: Heat Strengthened or Fully tempered.
 - 5. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.
 - 6. Inboard Lite: Guardian Clear float glass.
 - a. Heat Treatment: Heat Strengthened or Fully tempered.
 - 7. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 68 percent minimum.
 - b. Solar Heat Gain Coefficient: 0.37 maximum.
 - c. Winter Nighttime U-Factor: 0.245 maximum.
 - d. Summer Daytime U-Factor: 0.22 maximum.
 - 8. Safety glazing where required.
- D. **Glass Type IG-2:** Low-E Coated, Tinted Insulating Vision Glass.
 - 3. Basis-of-Design Product: Guardian Glass LLC; SunGuard SN 68 on CrystalGray.
 - 4. Overall Unit Thickness: 1 inch (25 mm).
 - 5. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
 - 6. Outboard Lite: Guardian CrystalGray Float Glass.
 - a. Coating Sputtered on Surface #2: Guardian SunGuard SN 68.
 - b. Heat Treatment: Heat Strengthened or Fully tempered.
 - 7. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.
 - 8. Inboard Lite: Guardian Clear float glass.
 - a. Heat Treatment: Heat Strengthened or Fully tempered.
 - 9. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Solar Heat Gain Coefficient: 0.29 maximum.
 - c. Winter Nighttime U-Factor: 0.245 maximum.
 - d. Summer Daytime U-Factor: 0.22 maximum.
 - 10. Safety glazing where required.
- E. **Glass Type IG-3:** Low-E Coated, Tinted Insulating Vision Glass.
 - 3. Basis-of-Design Product: Guardian Glass LLC; SunGuard SN 68 on Green.
 - 4. Overall Unit Thickness: 1 inch (25 mm).
 - 5. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
 - 6. Outboard Lite: Guardian Green Float Glass.
 - a. Coating Sputtered on Surface #2: Guardian SunGuard SN 68.
 - b. Heat Treatment: Heat Strengthened or Fully tempered.
 - 7. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.
 - 8. Inboard Lite: Guardian Clear float glass.
 - a. Heat Treatment: Heat Strengthened or Fully tempered.
 - 9. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 57 percent minimum.
 - b. Solar Heat Gain Coefficient: 0.29 maximum.
 - c. Winter Nighttime U-Factor: 0.245 maximum.
 - d. Summer Daytime U-Factor: 0.22 maximum.

10. Safety glazing where required.

F. **Glass Type IG-4:** Low-E Coated, Clear Insulating Vision Glass.

3. Basis-of-Design Product: Guardian Glass LLC; SunGuard SNE 50 on Clear.
4. Overall Unit Thickness: 1 inch (25 mm).
5. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
6. Outboard Lite: Guardian Clear Float Glass.
 - a. Coating Sputtered on Surface #2: Guardian SunGuard SNE 50.
 - b. Heat Treatment: Heat Strengthened or Fully tempered.
7. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.
8. Inboard Lite: Guardian Clear float glass.
 - a. Heat Treatment: Heat Strengthened or Fully tempered.
9. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 48 percent minimum.
 - b. Solar Heat Gain Coefficient: 0.25 maximum.
 - c. Winter Nighttime U-Factor: 0.24 maximum.
 - d. Summer Daytime U-Factor: 0.21 maximum.
10. Safety glazing where required.

G. **Glass Type IG-5:** Low-E Coated, Fritted, Clear Insulating Vision Glass.

1. Location: Curtainwall.
2. Basis-of-Design Product: Guardian Glass LLC; SunGuard SNX 70+ on Clear.
3. Overall Unit Thickness: 1 inch (25 mm).
4. Minimum Thickness of Each Glass Lite: 1/4 inch (6 mm).
5. Outboard Lite: Guardian Clear Float Glass.
 - a. Coating Sputtered on Surface #2: Guardian SunGuard SNX 70+.
 - b. Heat Treatment: Heat Strengthened or Fully tempered.
6. Interspace: Argon filled, 12 mm (1/2 inch) wide, hermetically sealed.
7. Inboard Lite: Guardian Clear float glass.
 - a. Ceramic Frit Pattern on No. 3 Surface: 40% Coverage Warm Gray Frit Dots.
 - b. Heat Treatment: Heat Strengthened or Fully tempered.
8. Glass Unit Performance Characteristics:
 - a. Visible Light Transmittance: 40 percent minimum.
 - b. Solar Heat Gain Coefficient: 0.24 maximum.
 - c. Winter Nighttime U-Factor: 0.24 maximum.
 - d. Summer Daytime U-Factor: 0.21 maximum.
9. Safety glazing where required.

END OF SECTION 08-8000

SECTION 08 91 19 - FIXED LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fixed [extruded-aluminum][and][formed-metal] louvers.
2. Fixed formed-metal acoustical louvers.
3. Blank-off panels for louvers

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for louvers in hollow-metal doors.
2. Section 081416 "Flush Wood Doors" for louvers in flush wood doors.
3. Section 099113 "Exterior Painting" for field painting exterior louvers.
4. Section 099123 "Interior Painting" for field painting interior 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. Horizontal Louver: Louver with horizontal blades (i.e., the axis of the blades are horizontal).
- C. Vertical Louver: Louver with vertical blades (i.e., the axis of the blades are vertical).
- D. 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.
- E. Wind-Driven-Rain-Resistant Louver: Louver that provides specified wind-driven-rain performance, as determined by testing in accordance with AMCA 500-L.
- F. Windborne-Debris-Impact-Resistant Louver: Louver that provides specified windborne-debris-impact resistance, as determined by testing in accordance with AMCA 540.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.
3. Third-Party Certifications: For each product.
4. Third-Party Certified Life Cycle Assessment: For each product.

C. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.
2. Show mullion profiles and locations.

D. Samples: For each type of metal finish required.

E. Delegated Design Submittal: For louvers indicated to comply with structural[and seismic] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed in accordance with AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.
- B. Windborne-debris-impact-resistance test reports.
- C. Sample Warranties: For manufacturer's special warranties.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel in accordance with the following:
 1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
 3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.6 FIELD CONDITIONS

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

1.7 WARRANTY

- A. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
- B. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.
 - 1. Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
 - b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
 - c. Cracking, peeling, or chipping.
 - 2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain fixed[and operable] louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural[and seismic] performance requirements and design criteria indicated.
- B. Structural Performance: Louvers withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures are considered to act normal to the face of the building.

1. Wind Loads:

- a. Determine loads based on pressures as indicated on Drawings.
- b. Determine loads based on a uniform pressure of [20 lbf/sq. ft.][30 lbf/sq. ft.]<Insert value>, acting inward or outward.
- c. Determine loads based on pressures indicated below:
 - 1) Corner Zone: Within <Insert distance> of building corners, uniform pressure of <Insert design wind pressure>, acting inward, and <Insert design wind pressure>, acting outward.
 - 2) Other Than Corner Zone: Uniform pressure of <Insert design wind pressure>, acting inward, and <Insert design wind pressure>, acting outward.

C. Windborne-Debris-Impact Resistance: Louvers located within 30 feet of grade pass [basic][enhanced] protection, when tested in accordance with AMCA 540.

D. Seismic Performance:

1. As indicated on Drawings.
2. Louvers, including attachments to other construction, withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirement>.
 - a. Design earthquake spectral response acceleration, short period (Sds) for Project is <Insert value>.
 - b. Component Importance Factor: [1.5][1.0].

E. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature range>.

G. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

2.3 FIXED EXTRUDED-ALUMINUM LOUVERS

A. Horizontal Nondrainable-Blade Louver, Extruded Aluminum:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [Ruskin; Air Distribution Technologies, Inc.]
 - b. [Air Balance; MESTEK, Inc.]
 - c. [Air Flow Company, Inc.]
 - d. [Aire Technologies, Inc.; DMI Companies]
 - e. [Airline Louvers; Mestek, Inc.]
 - f. [Airolite Company, LLC (The)]
 - g. [All-Lite Architectural Products]
 - h. [American Warming and Ventilating (AWV); Mestek, Inc.]
 - i. [Architectural Louvers Co.; Harry, LLC]
 - j. [Arrow United Industries; Mestek, Inc.]
 - k. [Carnes Company]
 - l. [Cesco Products; MESTEK, Inc.]
 - m. [Construction Specialties, Inc.]
 - n. [Greenheck Fan Corporation]
 - o. [Industrial Louvers Inc.]
 - p. [Louvers & Dampers, Inc.; Mestek, Inc.]
 - q. [Metal Form Manufacturing LLC; United Enertech Corp.]
 - r. [NCA Manufacturing, Inc.; Metal Industries, Inc.]
 - s. [Pottorff]
 - t. [Reliable Products, Inc.]
 - u. [Safe Air - Dowco]
 - v. [United Enertech Corp.]
 - w. [Vent Products Co., Inc]
 - x. <Insert manufacturer's name>
- 2. Louver Depth: [2 inches][4 inches][6 inches]<Insert dimension>.
 - 3. Blade Profile: [Plain blade without][Blade with] center baffle.
 - 4. Frame and Blade Nominal Thickness: Not less than [0.080 inch][0.060 inch for blades and 0.080 inch for frames].
 - 5. Mullion Type: [Exposed][Semirecessed][Fully recessed].
 - 6. Louver Performance Ratings:
 - a. Free Area: Not less than [7.5 sq. ft.][8.0 sq. ft.][8.5 sq. ft.]<Insert value> for 48-inch- wide by 48-inch- high louver.
 - b. Point of Beginning Water Penetration: Not less than [700 fpm][750 fpm][800 fpm][850 fpm][900 fpm][950 fpm]<Insert value>.
 - c. Air Performance: Not more than [0.10-inch wg]<Insert value> static pressure drop at [650-fpm][700-fpm][750-fpm]<Insert value> free-area [exhaust][intake] velocity.
 - 7. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

- A. General: Provide screen at [each exterior louver][louvers indicated].
 - 1. Screen Location for Fixed Louvers: Interior face.
 - 2. Screening Type: [Bird screening][Bird screening, except where insect screening is indicated][Insect screening].

- B. Secure screen frames to louver frames with [stainless steel machine screws][machine screws with heads finished to match louver], spaced a maximum of 6 inches from each corner and at 12 inches o.c.
- C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.
 - 1. Metal: Same type and form of metal as indicated for louver to which screens are attached.[Reinforce extruded-aluminum screen frames at corners with clips.]
 - 2. Finish: [Same finish as louver frames to which louver screens are attached][Mill finish unless otherwise indicated].
 - 3. Type: [Rewirable frames with a driven spline or insert][Non-rewirable, U-shaped frames].
- D. Louver Screening for Aluminum Louvers:
 - 1. Bird Screening, Aluminum: 1/2-inch- square mesh, 0.063-inch wire.
 - 2. Bird Screening, Stainless Steel: 1/2-inch- square mesh, 0.047-inch wire.
 - 3. Bird Screening, Flattened, Expanded Aluminum: 3/4 by 0.050 inch thick.
 - 4. Insect Screening, Aluminum: 18-by-16 mesh, 0.012-inch wire.
 - 5. Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.
- E. Louver Screening for Galvanized-Steel Louvers:
 - 1. Bird Screening, Galvanized Steel: 1/2-inch- square mesh, 0.041-inch wire.
 - 2. Bird Screening, Stainless Steel: 1/2-inch- square mesh, 0.047-inch wire.
 - 3. Insect Screening, Galvanized Steel: 18-by-14 mesh, 0.011-inch wire.
 - 4. Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.
- F. Louver Screening for Stainless Steel Louvers:
 - 1. Bird Screening, Stainless Steel: 1/2-inch- square mesh, 0.047-inch wire.
 - 2. Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.

2.5 BLANK-OFF PANELS

- A. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.
 - 1. Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.
 - 2. Galvanized-steel sheet for galvanized-steel louvers, not less than [0.040-inch][0.052-inch] nominal thickness.
 - 3. Stainless steel sheet for stainless steel louvers, not less than [0.038-inch][0.050-inch] nominal thickness, with grain running in same direction as grain of louver blades.
 - 4. Panel Finish: [Same finish applied to louvers][Same finish type applied to louvers, but black color].
 - 5. Attach blank-off panels with [clips][sheet metal screws]<Insert method>.
- B. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

1. Thickness: [1 inch][2 inches].
2. Metal Facing Sheets, Aluminum: Not less than 0.032-inch nominal thickness.
3. Metal Facing Sheets, Galvanized Steel: Not less than 0.028-inch nominal thickness.
4. Metal Facing Sheets, Stainless Steel: Not less than 0.031-inch nominal thickness.
5. Insulating Core: [Rigid, glass-fiber-board insulation][or][extruded-polystyrene foam]<Insert insulation material>.
6. Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard [extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness][channel frames], with corners mitered and with same finish as panels.
7. Seal perimeter joints between panel faces and louver frames with gaskets or sealant.
8. Panel Finish: [Same finish applied to louvers][Same type of finish applied to louvers, but black color].
9. Attach blank-off panels with [clips][sheet metal screws]<Insert method>.

2.6 MATERIALS

- A. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Galvanized-Steel Sheet: ASTM A653/A653M, [G60][G90] zinc coating, mill phosphatized.
- D. Stainless Steel Sheet: ASTM A240/A240M, Type 304, [No. 2B finish][No. 2D finish][No. 4 finish, with grain running parallel to length of blades and frame members][No. 4 finish, with grain running perpendicular to length of blades and frame members][No. 4 finish, with grain running perpendicular to length of blades and parallel to length of frame members][No. 6 finish].
- E. Fasteners: Use types and sizes to suit unit installation conditions.
 1. Use [Phillips flat-head][hex-head or Phillips pan-head][tamper-resistant] screws for exposed fasteners unless otherwise indicated.
 2. For fastening aluminum, use aluminum or 300 series stainless steel fasteners.
 3. For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless steel fasteners.
 4. For fastening stainless steel, use 300 series stainless steel fasteners.
 5. For color-finished louvers, use fasteners with heads that match color of louvers.
- F. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated in accordance with ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing in accordance with ASTM E488/E488M conducted by a qualified testing agency.

- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
- H. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- I. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.

2.7 FABRICATION

- A. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.
 - 1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern [unless horizontal mullions are indicated][where indicated].
 - 2. Horizontal Mullions: Provide horizontal mullions at joints [unless continuous vertical assemblies are indicated][where indicated].
- 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.
 - 1. Frame Type: [Channel][Exterior flange][Interior flange] unless otherwise indicated.
- E. Include supports, anchorages, and accessories required for complete assembly.
- F. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.
 - 1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
 - 2. Semirecessed Mullions: Where indicated, provide mullions partly recessed behind louver blades, so louver blades appear continuous. Where length of louver exceeds fabrication and handling limitations, fabricate with interlocking split mullions and close-fitting blade splices designed to permit expansion and contraction.
 - 3. Exposed Mullions: Where indicated, provide units with exposed mullions of same width and depth as louver frame. Where length of louver exceeds fabrication and

handling limitations, provide interlocking split mullions designed to permit expansion and contraction.

4. Exterior Corners: Prefabricated corner units with mitered [and welded blades][blades with concealed close-fitting splices] and with [fully recessed][semirecessed] mullions at corners.
- G. Provide [subsills made of same material as louvers][or][extended sills] for recessed louvers.
- H. Join frame members to each other and to fixed louver blades with fillet welds [concealed from view][, threaded fasteners, or both, as standard with louver manufacturer] unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.8 ALUMINUM FINISHES

- A. Finish louvers after assembly.
- B. Clear Anodic Finish: AAMA 611, [AA-M12C22A41, Class I, 0.018 mm][AA-M12C22A31, Class II, 0.010 mm] or thicker.
- C. Color Anodic Finish: AAMA 611, [AA-M12C22A42/A44, Class I, 0.018 mm][AA-M12C22A32/A34, Class II, 0.010 mm] or thicker.
 1. Color: [Champagne][Light bronze][Medium bronze][Dark bronze][Black][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
- D. Conversion-Coated Finish: AA-C12C42, nonetched, cleaned with inhibited chemicals, and chemical conversion coated with acid chromate-fluoride-phosphate.
- E. Factory-Primed Finish: AA-C12C42R1x with air-dried primer of not less than 2-mil dry film thickness.
- F. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- G. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with [AAMA 2604][AAMA 2605] and containing not less than [50][70] percent PVDF resin by weight in color coat.
 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [for seacoast and severe environments].
 2. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's

sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

- H. Superior-Performance Organic Finish, Three-Coat PVDF: 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. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [for seacoast and severe environments].
 - 2. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- I. Superior-Performance Organic Finish, Four-Coat PVDF: 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. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [for seacoast and severe environments].
 - 2. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- J. Superior-Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - 2. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.
- K. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.
 - 1. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.
 - 2. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.9 GALVANIZED-STEEL SHEET FINISHES

- A. Finish louvers after assembly.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent, so surfaces are free of oil and other contaminants. After cleaning, apply a conversion coating compatible with

the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair in accordance with ASTM A780/A780M.

- C. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 2 mils.
 - 1. Color and Gloss: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color and gloss>.

2.10 STAINLESS STEEL SHEET FINISHES

- A. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and openings, 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. 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.

3.3 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Form closely fitted joints with exposed connections accurately located and secured.
- D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying

a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

- F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

- A. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
- B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
- C. Restore louvers damaged during installation and construction, 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 19

SECTION 09 21 16.23 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gypsum board shaft wall assemblies.

1.2 ACTION SUBMITTALS

- A. Product Data: For each component of gypsum board shaft wall assemblies.
- B. Sustainable Design Submittals:

1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: From [an agency acceptable to authorities having jurisdiction][ICC-ES]<Insert evaluation agency> showing compliance with Project requirements, for the following:
 1. Studs and track.
 2. Equivalent corrosion-resistant coating on steel framing.
 3. Firestop track.
 4. Post-installed anchors.
 5. Power-actuated fasteners.
 6. <Insert requirements>.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage.
- B. Stack shaftliner and face panels flat and support them on risers on a flat platform to prevent sagging.
- C. Protect steel framing from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with gypsum-shaftliner-board manufacturer's written instructions.

- B. Do not install finish panels until installation areas are enclosed and conditioned.
- C. Do not install shaftliner and face panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Provide materials and construction identical to rated assembly indicated on Drawings tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by a testing and inspecting agency.
- C. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. Fire-Resistance Rating: [As indicated on Drawings][1 hour][2 hours][3 hours][4 hours]<Insert rating>.
- B. Minimum STC Rating: [As indicated on Drawings][51]<Insert rating>.
- C. Gypsum Shaftliner Board:
 - 1. Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with paper faces, 1 inch thick, with double beveled long edges.
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [American Gypsum]
 - 2) [Georgia-Pacific Gypsum LLC]
 - 3) [PABCO Gypsum]
 - 4) <Insert manufacturer's name>
 - 2. Moisture- and Mold-Resistant Type X: ASTM C1396/C1396M; manufacturer's proprietary fire-resistive liner panels with ASTM D3273 mold-resistance score of

10 rated in accordance with ASTM D3274, 1 inch thick, and with double beveled long edges.

- a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- 1) [American Gypsum]
- 2) [CertainTeed; SAINT-GOBAIN]
- 3) [Gold Bond Building Products, LLC provided by National Gypsum Company]
- 4) [PABCO Gypsum]
- 5) [USG Corporation]
- 6) <Insert manufacturer's name>

- D. Steel Framing, General: Complying with applicable requirements in AISI S220 and complying with requirements for fire-resistance-rated assemblies indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [MarinoWARE]
- d. [SCAFCO Steel Stud Company; Stone Group of Companies]
- e. [Steel Construction Systems; Stone Group of Companies]
- f. [The Mill Steel Co]
- g. <Insert manufacturer's name>

2. Protective Coating: [ASTM A653/A653M, G40][ASTM A653/A653M, G60][ASTM A653/A653M, G90]<Insert requirements> or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.

- a. Equivalent Corrosion Resistance: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.

- E. Studs: Profiles required for fire-resistance-rated assembly indicated on Drawings for repetitive, corner, and end members as follows:

1. Depth: [As indicated on Drawings][2-1/2 inches][4 inches][6 inches].
2. Minimum Base-Steel Thickness: [As indicated on Drawings][0.0179 inch][0.0219 inch][0.0329 inch][0.0341 inch][0.0380 inch][0.0428 inch]<Insert dimension>.

- F. Track: J-profile track required for fire-resistance-rated assembly indicated on Drawings with minimum long-leg length of [2 inches]<Insert dimension> and matching studs in

depth.

1. Minimum Base-Steel Thickness: [As indicated on Drawings][Matching studs][0.0179 inch][0.0219 inch][0.0329 inch][0.0341 inch][0.0380 inch][0.0428 inch]<Insert value>.
- G. Firestop Track: Deep top track manufactured to allow shaft wall heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated on Drawings; in base-steel thickness [indicated on Drawings][not less than that of studs]<Insert requirements> and in width required to comply with requirements of fire-rated assembly.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ClarkDietrich]
 - b. [Fire Trak Corp]
 - c. <Insert manufacturer's name>
- H. Elevator-Hoistway-Entrance Struts: Manufacturer's standard jamb strut with "J" profile and long-leg length of 3 inches, matching studs in depth, and with minimum [0.0329-inch]<Insert dimension> base-steel thickness.
- I. Finish Panels: [As indicated on Drawings.][Gypsum board as specified in Section 092900 "Gypsum Board."][Gypsum veneer plaster as specified in Section 092613 "Gypsum Veneer Plastering."][Cementitious backer units as specified in Section 092900 "Gypsum Board."][Cementitious backer units as specified in Section 093013 "Ceramic Tiling."]<Insert finish requirements.>
- J. Sound Attenuation Blankets: As specified in [Section 092900 "Gypsum Board."][Section 092613 "Gypsum Veneer Plastering."]

2.3 ACCESSORIES

- A. Provide accessories that comply with shaft wall manufacturer's written instructions.
- B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes as specified in [Section 092900 "Gypsum Board"] [Section 092613 "Gypsum Veneer Plastering"] that comply with shaft wall assembly manufacturer's written instructions for application indicated on Drawings.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated on Drawings.
- D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES [AC01][or][AC193] as appropriate for the substrate.
 2. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- E. Reinforcing: Steel reinforcing strips of corrosion-resistant steel complying with steel framing requirements and in [0.0329-inch]<Insert dimension> minimum base-steel thickness.
- F. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- G. Gypsum Board Cants:
1. Gypsum Board Panels: As specified in Section 092900 "Gypsum Board," [Type X, 1/2- or 5/8-inch]<Insert requirements> panels.
 2. Adhesive: Laminating adhesive as specified in Section 092900 "Gypsum Board."
 3. Non-Structural Steel Framing: As specified in Section 092216 "Non-Structural Metal Framing."

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. Examine shaftliner and face panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or top track to surfaces indicated to receive sprayed fire-resistive materials unless otherwise indicated on Drawings. Where offset anchor plates are required, provide continuous plates fastened to building structure as required by fire-resistance-rated assembly but not more than 24 inches o.c.
 2. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated on Drawings. Protect remaining fire-resistive materials from damage.
 3. Patch or replace sprayed fire-resistive materials removed or damaged during

installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fire Protection."

3.3 INSTALLATION OF GYPSUM BOARD SHAFT WALL ASSEMBLIES

- A. General: Install shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated on Drawings and manufacturer's written installation instructions.
- B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.
- C. Install supplementary framing in shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.
 - 1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
 - 2. Reinforcing: Provide where items attach directly to shaft wall assembly as indicated on Drawings; accurately position and secure behind at least one layer of face panel.
- D. Penetrations: At penetrations in shaft wall assemblies, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons and floor indicators, and similar items.
- E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels while maintaining continuity of fire-rated construction.
- F. Firestop Track: Where indicated on Drawings, install to maintain continuity of fire-resistance-rated assembly.
- G. Control Joints: Install control joints [at locations indicated on Drawings][in accordance with ASTM C840 and in specific locations approved by Architect] while maintaining fire-resistance rating of shaft wall assemblies.
- H. Sound-Rated Shaft Wall Assemblies: Seal with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.
- I. Gypsum Board Cants: At projections into shaft [exceeding 4 inches][where indicated on Drawings], install gypsum board cants covering tops of projections.
 - 1. Slope cant panels at least 75 degrees from horizontal. Set base edge of panels in adhesive and secure top edges to shaft walls at 24 inches o.c. with screws fastened to shaft wall framing.
 - 2. Where non-structural steel framing is required to support gypsum board cants, install framing at 24 inches o.c. and extend studs from the projection to shaft wall

framing.

- J. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.4 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 shaftliner and face panels that are wet, moisture damaged, or mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and 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 21 16.23

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Nonstructural steel framing.

B. Related Requirements:

1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior loadbearing, structural framing.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of nonstructural steel framing and fastening and anchorage details.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, and attachments to adjoining work.
3. <Insert requirements>.

- C. Sustainable Design Submittals:

1.4 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For code-compliance certification of studs and track.

- B. Evaluation Reports: From [an agency acceptable to authorities having jurisdiction][ICC-ES]<Insert evaluation agency> showing compliance with Project requirements, for the following:

1. Studs and track.
2. High-strength steel studs and track.
3. Equivalent corrosion-resistant coating on steel framing.
4. Firestop track.
5. Post-installed anchors.

6. Power-actuated fasteners.
7. <Insert requirements>.

1.5 QUALITY ASSURANCE

- A. Code-Compliance Certification of Studs and Track: Provide documentation that framing members are certified in accordance with product-certification program of [the Steel Framing Industry Association][the Steel Stud Manufacturers Association][or][the Supreme Steel Framing System Association].

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- B. Protect materials from corrosion, deformation, and other damage during delivery, storage, and handling in accordance with AISI S202.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: Where indicated on Drawings, provide assemblies incorporating nonstructural steel framing identical to those of assemblies tested for fire resistance in accordance with ASTM E119 by an independent testing agency.
- B. STC-Rated Assemblies: Where indicated on Drawings, provide assemblies incorporating nonstructural framing identical to those of assemblies tested in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.
- C. Horizontal Deflection: For [composite][non-composite] wall assemblies, limited to [1/240][1/360]<Insert requirements> of the wall height based on the following horizontal loading:
 1. Horizontal Loading: [As indicated on Drawings][5 lbf/sq. ft.][10 lbf/sq. ft.]<Insert value>.

2.2 NONSTRUCTURAL STEEL FRAMING

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with requirements in AISI S220 for conditions indicated on Drawings.
 1. Protective Coating: [ASTM A653/A653M, G40][ASTM A653/A653M, G60]<Insert

requirements> or coating with demonstrated equivalent corrosion resistance. Galvannealed products are unacceptable.

- a. Equivalent Corrosion-Resistant Coating: Evaluation report acceptable to authorities having jurisdiction demonstrates corrosion resistance equivalent to specified protective coating.
- C. Studs and Track: Conventional members, roll-formed into standard shapes without surface deformations to stiffen framing members.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [Marino\WARE]
 - f. [MBA Building Supplies]
 - g. [MBA Metal Framing]
 - h. [MRI Steel Framing, LLC]
 - i. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - j. [Steel Construction Systems; Stone Group of Companies]
 - k. [Steel Network, Inc. (The)]
 - l. [TELLING Industries]
 - m. [UMS Metal Building Systems USA LLC]
 - n. [US Frame Factory]
 - o. <Insert manufacturer's name>
 2. Minimum Base-Steel Thickness: [As indicated on Drawings][As required by performance requirements for horizontal deflection][0.0179 inch][0.0296 inch].
 3. Minimum Yield Strength: 33 ksi.
 4. Depth: [As indicated on Drawings][1-5/8 inches][2-1/2 inches][3-5/8 inches][4 inches][6 inches]<Insert dimension>.
- D. Slip-Type Head Joints: Where indicated on Drawings, provide[one of] the following:
1. Clip System: Clips designed for use in head-of-wall deflection conditions that provide a positive attachment of studs to track while allowing [1-1/2-inch][2-inch][2-1/2-inch][3-inch]<Insert dimension> minimum vertical movement.
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [CEMCO; California Expanded Metal Products Co.]
 - 2) [ClarkDietrich]
 - 3) [CRACO Mfg., Inc.]

- 4) [Marino\WARE]
 - 5) [MBA Metal Framing]
 - 6) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 7) [Steel Construction Systems; Stone Group of Companies]
 - 8) [Steel Network, Inc. (The)]
 - 9) [Super Stud Building Products Inc.]
 - 10) [US Frame Factory]
 - 11) <Insert manufacturer's name>
 2. Slotted Deflection Track: Steel sheet top track manufactured with [2-1/2-inch-]<Insert dimension> deep flanges that allow positive attachment to studs through long slots and prevent deflection of structure above from cracking finishes applied to framing; in base-steel thickness not less than that of studs and in width to accommodate depth of studs.
 - a. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1) [CEMCO; California Expanded Metal Products Co.]
 - 2) [ClarkDietrich]
 - 3) [Jaimes Industries, Inc.]
 - 4) [Marino\WARE]
 - 5) [MBA Building Supplies]
 - 6) [MRI Steel Framing, LLC]
 - 7) [SCAFCO Steel Stud Company; Stone Group of Companies]
 - 8) [Steel Construction Systems; Stone Group of Companies]
 - 9) [Steel Network, Inc. (The)]
 - 10) [TELLING Industries]
 - 11) [The Mill Steel Co]
 - 12) [US Frame Factory]
 - 13) <Insert manufacturer's name>
- E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated on Drawings.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [Jaimes Industries, Inc.]
 - d. [Marino\WARE]
 - e. [MBA Building Supplies]
 - f. [MRI Steel Framing, LLC]
 - g. [Phillips Manufacturing Co]
 - h. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - i. [Steel Construction Systems; Stone Group of Companies]

- j. [Steel Network, Inc. (The)]
 - k. [TELLING Industries]
 - l. [The Mill Steel Co]
 - m. [US Frame Factory]
 - n. <Insert manufacturer's name>
2. Minimum Base-Steel Thickness: [As indicated on Drawings][0.0179 inch][0.0269 inch][0.0296 inch][0.0329 inch]<Insert thickness>.
- F. Rigid Hat-Shaped Furring Channels:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [Marino\WARE]
 - f. [MBA Building Supplies]
 - g. [MBA Metal Framing]
 - h. [MRI Steel Framing, LLC]
 - i. [Phillips Manufacturing Co]
 - j. [SCAFCO Steel Stud Company; Stone Group of Companies]
 - k. [Steel Construction Systems; Stone Group of Companies]
 - l. [Steel Network, Inc. (The)]
 - m. [TELLING Industries]
 - n. [The Mill Steel Co]
 - o. [UMS Metal Building Systems USA LLC]
 - p. [US Frame Factory]
 - q. <Insert manufacturer's name>
2. Minimum Base-Steel Thickness: [As indicated on Drawings][0.0179 inch][0.0296 inch][0.0329 inch]<Insert thickness>.
3. Depth: [As indicated on Drawings][7/8 inch][1-1/2 inches]<Insert requirements>.
- G. Resilient Furring Channels: 1/2-inch- deep, steel sheet members designed to reduce sound transmission.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
- a. [CEMCO; California Expanded Metal Products Co.]
 - b. [ClarkDietrich]
 - c. [CRACO Mfg., Inc.]
 - d. [Jaimes Industries, Inc.]
 - e. [Marino\WARE]

- f. [MBA Building Supplies]
- g. [MRI Steel Framing, LLC]
- h. [Phillips Manufacturing Co]
- i. [SCAFCO Steel Stud Company; Stone Group of Companies]
- j. [Steel Construction Systems; Stone Group of Companies]
- k. [Steel Network, Inc. (The)]
- l. [TELLING Industries]
- m. [The Mill Steel Co]
- n. [US Frame Factory]
- o. <Insert manufacturer's name>

2. Configuration: [Asymmetrical][or][hat shaped].

H. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 3/4 inch, minimum base-steel thickness of 0.0179 inch, and depth required to fit insulation thickness indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [CEMCO; California Expanded Metal Products Co.]
- b. [ClarkDietrich]
- c. [CRACO Mfg., Inc.]
- d. [Jaimes Industries, Inc.]
- e. [MarinoWARE]
- f. [MBA Building Supplies]
- g. [MBA Metal Framing]
- h. [MRI Steel Framing, LLC]
- i. [Phillips Manufacturing Co]
- j. [SCAFCO Steel Stud Company; Stone Group of Companies]
- k. [Steel Construction Systems; Stone Group of Companies]
- l. [Steel Network, Inc. (The)]
- m. [TELLING Industries]
- n. [The Mill Steel Co]
- o. [US Frame Factory]
- p. <Insert manufacturer's name>

2.3 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Adjustable Wall-Furring Brackets: ASTM A653/A653M [G40][G60] hot-dip galvanized steel sheet in minimum 0.0329-inch- base-steel thickness with serrated edges for attaching furring channels to exterior masonry or concrete walls.

- C. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 - 1. Adjustable Wall-Furring Brackets for Tie Wire: Use minimum double strand of 0.0625-inch- diameter wire, or triple strand of 0.0475-inch- diameter wire to attach furring channels.
 - 2. Suspended-Ceiling Systems:
 - a. Splicing Carrying Channels and Furring Members: Use double loops of minimum 0.0625-inch- diameter wire.
 - b. Saddle Tying Main Runners and Cross Furring: Use minimum 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.
- D. Post-Installed Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES [AC01][AC193][AC58][or][AC308] as appropriate for the substrate.
 - 1. Securing Hangers:
 - a. Type: [Torque-controlled, expansion anchor][torque-controlled, adhesive anchor][or][adhesive anchor].
 - b. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated on Drawings.
 - c. Stainless Steel Material for Exterior or Interior Locations: Alloy [Group 1][Group 2] stainless steel bolts, ASTM F593, and nuts, ASTM F594.
- E. Power-Actuated Anchors: Fastener systems with an evaluation report, acceptable to authorities having jurisdiction, based on ICC-ES AC70.
- F. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, [0.162 inch]<Insert dimension> in diameter.
- G. Flat Hangers: ASTM A653/A653M [G40][G60] hot-dip galvanized steel sheet, [in size indicated on Drawings][1 by 3/16 inch by length indicated on Drawings]<Insert dimensions>.
- H. Isolation Strip at Exterior Walls: Provide[one of] the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D226/D226M, 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 thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas, substrates, and conditions, with Installer present, for compliance with

requirements and other conditions affecting performance of the Work.

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

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices required to other trades for installation in advance of time needed for coordination and construction.
- B. Coordination with Sprayed Fire-Resistive Materials:
 - 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling track to surfaces indicated on Drawings to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
 - 2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of nonstructural steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated on Drawings. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION OF NONSTRUCTURAL METAL FRAMING, GENERAL

- A. Installation Standard: ASTM C754.
 - 1. Gypsum Plaster Assemblies: Also comply with requirements in ASTM C841 that apply to framing installation.
 - 2. Portland Cement Plaster Assemblies: Also comply with requirements in ASTM C1063 that apply to framing installation.
 - 3. Gypsum Veneer Plaster Assemblies: Also comply with requirements in ASTM C844 that apply to framing installation.
 - 4. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.
- C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- D. Install bracing at terminations in assemblies.
- E. Do not bridge building control and expansion joints with framing members. Frame both sides of joints independently.

3.4 INSTALLATION OF NONSTRUCTURAL STEEL FRAMING

- A. Install framing system components at spacings indicated on Drawings, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: [As required by horizontal deflection performance requirements][16 inches o.c.][24 inches o.c.] unless otherwise indicated on Drawings.
 - 2. Multilayer Application: [As required by horizontal deflection performance requirements][16 inches o.c.][24 inches o.c.] unless otherwise indicated on Drawings.
 - 3. Tile Backing Panels: [As required by horizontal deflection performance requirements][16 inches o.c.] unless otherwise indicated on Drawings.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Install track at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated on Drawings to terminate at suspended ceilings. Continue framing around ducts that penetrate 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 track section (for cripple studs) at head and secure to jamb studs.
 - a. Install two studs at each jamb unless otherwise indicated on Drawings.
 - b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
 - c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure unless otherwise indicated on Drawings.
 - 3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated on Drawings. 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 on Drawings and support closures to make partitions continuous from floor to underside of solid structure.
 - a. Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated on Drawings.
 - 5. STC-Rated Partitions: Install framing to comply with STC-rated assembly indicated on Drawings.
 - 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 at least two studs at ends of arcs, place studs 6 inches o.c.
- E. Direct Furring:
 1. Screw to wood framing.
 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- F. Wall-Furring Bracket Systems: Install brackets with serrated edges facing upward spaced at minimum 48 inches o.c. vertically with 6 inches maximum from floor and ceiling, and minimum 36 inches o.c. horizontally with 4 inches maximum from abutting construction, unless otherwise indicated on Drawings.
- G. Z-Shaped Furring Members:
 1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-shaped furring members spaced [24 inches]<Insert dimension> 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 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 from corner and cut insulation to fit.
- H. Suspended Assemblies: Isolate suspension assemblies from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
 1. Hangers: 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 spaced [as indicated on Drawings]<Insert requirements>.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - b. 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.
 - 1) Size supplemental suspension members and hangers to support ceiling loads within [performance limits established by referenced installation standards]<Insert deflection limit>.

- c. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - d. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 - e. Do not attach hangers to steel roof deck.
 - f. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 - g. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 - h. Do not connect or suspend framing from ducts, pipes, or conduit.
- 2. Carrying Channels (Main Runners): U-channels spaced [as indicated on Drawings]<Insert requirements>.
 - 3. Furring Channels (Furring Members): [As indicated on Drawings][U-channels][Steel studs and track][High-strength steel studs and track][Rigid hat-shaped furring channels][Resilient furring channels]<Insert requirements>.
 - a. Spacing: [As indicated on Drawings]<Insert requirements>.
 - b. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
 - 4. Seismic Bracing: Sway-brace suspension systems [with hangers used for support]<Insert requirements>.
- I. Installation Tolerances for Nonstructural Steel Framing:
- 1. Framing Members: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.
 - 2. Suspended Assemblies: Install suspension systems that are level to within [1/8 inch in 12 ft.]<Insert dimensions> measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.
2. Section 079219 "Acoustical Joint Sealants" for acoustical joint sealants installed in gypsum board assemblies.
3. Section 092116.23 "Gypsum Board Shaft Wall Assemblies" for steel shaft wall framing, gypsum shaft liners, and other components of shaft wall assemblies.
4. Section 092216 "Non-Structural Metal Framing" for nonstructural steel framing and suspension systems that support gypsum board panels.
5. Section 092613 "Gypsum Veneer Plastering" for gypsum base for veneer plaster and for other components of gypsum-veneer-plaster finishes.
6. Section 093013 "Ceramic Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Locations and installation of control and expansion joints, including plans, elevations, sections, and attachment details.

C. Samples for Initial Selection:

1. Trim Accessories: For [aluminum][and][base-of-wall PVC moisture-barrier]<Insert requirements> trim.
2. Texture Finish: For each type required.

D. Samples for Verification: Actual sample of finished products for the following:

1. Trim Accessories: Actual sample of finished products for each profile of [aluminum][and][base-of-wall PVC moisture-barrier]<Insert requirements> trim required.
 - a. Size: Full size profile, [12 inches]<Insert dimension> long,
2. Textured Finishes: [Manufacturer's standard size]<Insert requirements> for each

textured finish required and on same backing indicated for Work.

E. Sustainable Design Submittals:

1.3 MOCKUPS

A. Build mockups of at least [100 sq. ft.]<Insert dimension> in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

- a. Each level of gypsum board finish required for use in exposed locations.
- b. Each texture finish required.

2. Apply or install final decoration required, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or blotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of gypsum panel and joint finishing material from single source with

resources to provide products of consistent quality in appearance and physical properties.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E119; tested by a qualified testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings in accordance with ASTM E90 and classified in accordance with ASTM E413; tested by a qualified testing agency.

2.3 GYPSUM BOARD, GENERAL

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- B. Size: Provide panel products in maximum lengths and widths available that will minimize joints in each area and that correspond with support system specified or indicated on Drawings.

2.4 INTERIOR GYPSUM BOARD

- A. Gypsum Wallboard: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 - 2. Thickness: [As indicated on Drawings][1/4 inch][3/8 inch][1/2 inch].
 - 3. Long Edges: [Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>.
- B. Gypsum Board, Type X: ASTM C1396/C1396M.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers

offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
2. Thickness: [As indicated on Drawings][5/8 inch][3/4 inch].
 3. Long Edges: [Tapered][Tapered and featured (rounded or beveled) for prefilling]<Insert requirements>.
- C. Gypsum Board, Type C: ASTM C1396/C1396M; manufactured to have increased fire-resistive capability.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 2. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 4. Long Edges: Tapered.
- D. Abuse-Resistant Gypsum Board: ASTM C1396/C1396M, tested in accordance with ASTM C1629/C1629M.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]

- d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
 - 2. Core: [As indicated on Drawings][5/8 inch, Type X]<Insert requirements>.
 - 3. Surface Abrasion: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements.
 - 4. Indentation: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements.
 - 5. Soft-Body Impact: ASTM C1629/C1629M, meets or exceeds [Level 1][Level 2][Level 3] requirements.
 - 6. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 - 7. Long Edges: [Tapered]<Insert requirements>.
- E. Mold-Resistant Gypsum Board: ASTM C1396/C1396M; manufactured with moisture- and mold-resistant core and paper surfaces.
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Georgia-Pacific Gypsum LLC]
 - d. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - e. [PABCO Gypsum]
 - f. [Panel Rey]
 - g. [USG Corporation]
 - h. <Insert manufacturer's name>
 - 2. Core: [As indicated on Drawings][1/2 inch, regular type][5/8 inch, Type X][5/8 inch, Type C as required by fire-resistance-rated assembly indicated on Drawings]<Insert requirements>.
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.
 - 4. Long Edges: [Square][Tapered]<Insert requirements>.
- F. Acoustically Enhanced Gypsum Board: ASTM C1766; multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.
- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [CertainTeed; SAINT-GOBAIN]
 - b. [Gold Bond Building Products, LLC provided by National Gypsum Company]
 - c. [PABCO Gypsum]
 - d. <Insert manufacturer's name>
2. Core: [As indicated on Drawings][1/2 inch, regular type][5/8 inch, Type X]<Insert requirements>.
3. Long Edges: Tapered.

2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M requirements.
 1. Mold-Resistant Joint Compound: Use mold-resistant formulations with mold-resistant panel products.
- B. Joint Tape:
 1. Interior Gypsum Board: Paper.
 2. Exterior Gypsum Soffit Board: Paper.
 3. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
 4. Tile Backing Panels: As recommended in writing by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
 1. 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 [setting-type taping][drying-type, all-purpose] compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use [setting-type, sandable topping][drying-type, all-purpose] compound.
 4. Finish Coat: For third coat, use [setting-type, sandable topping][drying-type, all-purpose] compound.
 5. Skim Coat: For final coat of Level 5 finish, use [setting-type, sandable topping compound][drying-type, all-purpose compound][high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish].
- D. Joint Compound for Exterior Applications:
 1. Exterior Gypsum Soffit Board: Use setting-type taping compound and setting-type, sandable topping compound.
 2. Glass-Mat Gypsum Sheathing Board: As recommended in writing by sheathing

board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended in writing by backing panel manufacturer.
2. Cementitious Backer Units: As recommended in writing by backer unit manufacturer.
3. Water-Resistant Gypsum Backing Board: Use setting-type taping compound and setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended in writing by manufacturer for directly adhering gypsum panels to continuous substrate.
- C. Steel Drill Screws: ASTM C1002 unless otherwise specified or indicated on Drawings.
1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backer units, use screws of type and size recommended in writing by panel manufacturer.
- D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers as follows:
1. Non-Fire-Resistance-Rated Assemblies: [Glass][or][slag or rock wool].
 2. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- E. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."
- F. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."
- G. Vapor Retarder: As specified in Section 072600 "Vapor Retarders."

PART 3 - EXECUTION

3.1 EXAMINATION

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

- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840 requirements.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 - 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 - 2. Fit gypsum panels around ducts, pipes, and conduits.
 - 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- I. 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.

- J. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 requirements and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- K. Install sound-attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 - 1. Gypsum Wallboard: [As indicated on Drawings][Vertical surfaces unless otherwise indicated].
 - 2. Lightweight Gypsum Wallboard: [As indicated on Drawings][Vertical surfaces unless otherwise indicated].
 - 3. Gypsum Board, Type X: [As indicated on Drawings][Where required for fire-resistance-rated assembly][Vertical surfaces unless otherwise indicated]<Insert requirements>.
 - 4. Lightweight Gypsum Board, Type X: [As indicated on Drawings][Where required for fire-resistance-rated assembly][Vertical surfaces unless otherwise indicated]<Insert requirements>.
 - 5. Gypsum Board, Type C: [As indicated on Drawings][Where required for specific fire-resistance-rated assembly indicated]<Insert requirements>.
 - 6. Flexible Gypsum Board: [As indicated on Drawings][Apply in double layer at curved assemblies]<Insert requirements>.
 - 7. Gypsum Ceiling Board: [As indicated on Drawings][Ceiling surfaces]<Insert requirements>.
 - 8. Foil-Backed Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 9. Abuse-Resistant Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 10. Impact-Resistant Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 11. Mold-Resistant Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 12. Lightweight Mold-Resistant Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 13. Glass-Mat Interior Gypsum Board: [As indicated on Drawings]<Insert requirements>.
 - 14. Acoustically Enhanced Gypsum Board: [As indicated on Drawings]<Insert requirements>.
- B. Single-Layer Application:
 - 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated on Drawings.
 - 2. On partitions/walls, apply gypsum panels [vertically (parallel to

framing)][horizontally (perpendicular to framing)] unless otherwise specified or indicated on Drawings or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.
3. On Z-shaped furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated on Drawings or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over studs or furring members and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated on Drawings or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-shaped furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers [and face layers separately to supports with screws][with screws; fasten face layers with adhesive and supplementary fasteners].

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches o.c.

3.4 APPLICATION OF JOINT TREATMENT MATERIALS

- A. Finishing Panel Products: Treat joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare panel 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 panel joints, except for trim products specifically indicated as not intended to receive tape.
- D. Interior Gypsum Board: Finish panels to levels indicated below and in accordance with ASTM C840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 2: [Panels that are substrate for tile][Panels that are substrate for acoustical tile][Where indicated on Drawings]<Insert locations>.
 - 3. Level 3: [Where indicated on Drawings]<Insert locations>.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 4. Level 4: [At panel surfaces that will be exposed to view unless otherwise indicated]<Insert locations>.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
 - 5. Level 5: [Where indicated on Drawings]<Insert locations>.
 - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- E. Exterior Gypsum Board for Ceilings and Soffits: Finish in accordance with manufacturer's written instructions.
- F. Glass-Mat Faced Panels: Finish in accordance with manufacturer's written instructions.
- G. Cementitious Backer Units: Finish in accordance with manufacturer's written instructions.

3.5 PROTECTION

- A. Protect adjacent surfaces from joint compound and promptly remove from floors and other non-gypsum board surfaces. Repair surfaces stained, marred, or otherwise damaged during gypsum board installation and finishing.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Thresholds.
3. Tile backing panels.
4. Crack isolation membranes.
5. Setting material.
6. Grout materials.

B. Related Requirements:

1. [Section 071326 "Self-Adhering Sheet Waterproofing"] [Section 071353 "Elastomeric Sheet Waterproofing"] [Section 071354 "Thermoplastic Sheet Waterproofing"] [Section 071413 "Hot Fluid-Applied Rubberized Asphalt Waterproofing"] [Section 071416 "Cold Fluid-Applied Waterproofing"] for waterproofing under thickset mortar beds.
2. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.
3. Section 092400 "Cement Plastering" for scratch coat for thickset mortar setting-bed installations.
4. Section 092613 "Gypsum Veneer Plastering" for cementitious backer units.
5. Section 092900 "Gypsum Board" for tile backing panels.
6. Section 093023 "Glass Tiling."
7. Section 093033 "Stone Tiling."
8. Section 096340 "Stone Flooring" for stone thresholds.

1.2 DEFINITIONS

- A. General: Definitions in ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.
- B. Face Size: Actual tile size, excluding spacer lugs.
- C. Large Format Tile: Tile with at least one edge 15 inches or longer.
- D. Module Size: Actual tile size plus joint width indicated.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.
 1. Review requirements in ANSI A108.01 for substrates and for preparation by

other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations, plans, and elevations, of each type of tile and tile pattern. Show widths, details, and locations of movement joints in tile substrates and finished tile surfaces. [Show thresholds.]
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.
- D. Samples for Verification:
 - 1. Full-size units of each type and composition of tile and for each color and finish required.[For ceramic mosaic tile in color blend patterns, provide full sheets of each color blend.][For tile with aesthetic classification V3 or V4, provide 12 tiles from same production run.]
 - 2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least [12 inches square][36 inches square]<Insert size>, but not fewer than four tiles. Use grout of type and in color or colors approved for completed Work.
 - 3. Full-size units of each type of trim and accessory[for each color and finish required].
 - 4. Stone thresholds in 6-inch lengths.
 - 5. Metal flooring transitions 6-inch lengths.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Master Grade Certificates: For each shipment, type, and composition of tile, signed by tile manufacturer and Installer.
- C. Product Certificates: For each type of product, including product use classification.
- D. Product Test Reports:
 - 1. Tile-setting and -grouting products.
 - 2. Certified porcelain tile.
 - 3. Slip-resistance test reports from qualified independent testing agency.
- E. Field Quality-Control Reports: Water test reports of membrane in wet areas.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials, from the same production run, to Owner that match products installed and that are packaged with protective covering for

storage and identified with labels describing contents.

1. Tile and Trim Units:[Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.]
 - a. <Insert, in separate subparagraphs, tile-type designation or description and quantity required for each category of tile for which extra material is required>.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.7 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer is [a Five-Star member of the National Tile Contractors Association][or][a Trowel of Excellence member of the Tile Contractors' Association of America].
2. Installer's supervisor for Project holds the International Masonry Institute's Supervisor Certification.
3. Installer employs only [Ceramic Tile Education Foundation Certified Installers][or][installers recognized by the U.S. Department of Labor as Journeyman Tile Layers] for Project.
4. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of [mud floors][mud walls][membranes][shower receptors][and][large format tile].

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockup off[each type of] floor tile installation.
2. Build mockup off[each type of] wall tile installation.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.
- B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

- D. Store liquid materials in unopened containers and protected from freezing.

1.10 FIELD 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.

1.11 WARRANTY

- A. System Warranty: Manufacturer's non-prorated comprehensive warranty that agrees to repair and replace defective installation areas, material, and labor that fail under normal usage within specified warranty period.

- 1. Warranty Period: 20 years from date of Product Purchase.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Tile: Obtain [tile of each type and color or finish][tile of each type][tile of each color or finish][tile] from single source or producer.

- 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

- B. Tiling System: Obtain system products from single manufacturer and each aggregate from single source or producer.

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. See specified product in finish schedule drawings, or equal substitutions may be considered after bidding.

- 2. Obtain setting and grouting materials, except for unmodified portland cement and aggregate, from single manufacturer.
 - 3. Obtain underlayment from manufacturer of setting and grouting materials.
 - 4. Obtain waterproof membrane, crack isolation, and other required membranes from manufacturer of setting and grouting materials.
 - 5. Obtain joint sealants from manufacturer of setting and grouting materials.

- C. Accessory Products: Obtain each of the following products specified in this Section from a single manufacturer:

1. Stone thresholds.
2. Backer units.

2.2 PRODUCTS, GENERAL

- A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
 1. Provide tile complying with Standard Grade requirements[unless otherwise indicated].
- B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCNA installation methods specified in tile installation schedules, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.
- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 1. Where tile is indicated for installation [in swimming pools][on exteriors][or][in wet areas], do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.
- E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.3 PORCELAIN TILE

- A. Porcelain Tile Type: [Unglazed][Glazed][Chemical resistant].
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [See specified product in finish schedule drawings, or equal substitutions may be considered after bidding.
 2. Certification: Tile certified by the Porcelain Tile Certification Agency.
 3. Face Size Variation: Rectified.
 4. Thickness: [1/4 inch][3/8 inch][1/2 inch].
 5. Product Use Classification: [Interior, Dry (ID)][Interior, Wet (IW)][Interior, Wet

- Plus (IW+))[[Exterior, Wet (EW)]]Oil/Greases (O/G)].
6. Physical Properties: Chemical resistant when tested with indicated chemicals in accordance with ASTM C650.
 7. Tile Color, Glaze, and Pattern: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color, glaze, and pattern>.
 8. Grout Color: [As indicated by manufacturer's designations][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
 9. Precoat with temporary protective coating.
 10. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable[and matching characteristics of adjoining flat tile]. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cap: Surface bullnose, module size [same as adjoining flat tile]<Insert size>.
 - b. External Corners: Surface bullnose, module size [same as adjoining flat tile]<Insert size>.
 - c. Internal Corners: Field-butt square corners.
 - d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch across nominal 4-inch dimension.

2.4 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Granite Thresholds: ASTM C615/C615M, with [polished][honed]<Insert finish> finish.
 1. Description:
 - a. Uniform, [fine][medium]-grained, [white][gray][black]<Insert color> stone without veining.
 - b. Match Architect's sample.
 - c. See specified product in finish schedule drawings, or equal substitutions may be considered after bidding.
- C. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of [10][12] in accordance with ASTM C1353/C1353M or ASTM C241/C241M and with honed finish.
 1. Description:
 - a. Uniform, fine- to medium-grained white stone with gray veining.
 - b. Match Architect's sample.

- c. See specified product in finish schedule drawings, or equal substitutions may be considered after bidding.

2.5 TILE BACKING PANELS

- A. Cementitious Backer Units: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges in maximum lengths available to minimize end-to-end butt joints.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. See specified product in finish schedule drawings, or equal substitutions may be considered after bidding.
 - 2. Thickness: [1/4 inch][1/2 inch][5/8 inch][As indicated on Drawings].
 - 3. Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

2.6 CRACK ISOLATION MEMBRANES

- A. General: Manufacturer's standard product[, selected from the following,] that complies with ANSI A118.12 for [standard performance][high performance] and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.
- B. Crack Isolation Membrane, Polyethylene Sheet: Polyethylene faced on both sides with polyester fabric.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Custom Building Products]
 - b. [Laticrete International, Inc.]
 - c. [MAPEI Corporation]
 - d. [Noble Company (The)]
 - e. [Schluter Systems L.P.]
 - f. <Insert manufacturer's name>

2.7 SETTING MATERIALS

- A. Portland Cement Mortar (Thickset) Installation Materials: ANSI A108.02.
 - 1. Cleavage Membrane: Installer's option of material that complies with ANSI A108.02, paragraph 3.8.

2. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A1064/A1064M except for minimum wire size.
 3. Expanded Metal Lath: Diamond-mesh lath complying with ASTM C847.
 - a. Base Metal and Finish for Interior Applications: Uncoated or zinc-coated (galvanized) steel sheet, with uncoated steel sheet painted after fabrication into lath.
 - b. Base Metal and Finish for Exterior Applications: Zinc-coated (galvanized) steel sheet.
 - c. Configuration over Studs and Furring: Flat.
 - d. Configuration over Solid Surfaces: Self-furring.
 - e. Weight: [2.5 lb/sq. yd.][3.4 lb/sq. yd.].
 4. Latex Additive: [Manufacturer's standard][acrylic resin][or][styrene-butadiene-rubber] water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed.
- B. Standard Dry-Set Mortar (Thinset): ANSI A118.1.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ARDEX Americas]
 - b. [Boiardi Products Corporation; a QEP company]
 - c. [Bostik; Arkema]
 - d. [C-Cure]
 - e. [Custom Building Products]
 - f. [H.B. Fuller Construction Products Inc. / TEC]
 - g. [Laticrete International, Inc.]
 - h. [MAPEI Corporation]
 - i. [Parex, a Sika brand]
 - j. [Siena Tile & Stone Installation Products; Omega Products International]
 - k. [Southern Grouts & Mortars, Inc.]
 - l. [Summitville Tiles, Inc.]
 2. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to other requirements in ANSI A118.1.

2.8 GROUT MATERIALS

- A. Sand-Portland Cement Grout: ANSI A108.10, consisting of white or gray cement and white or colored aggregate as required to produce color indicated.
- B. Standard Cement Grout: ANSI A118.6.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers

offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [ARDEX Americas]
- b. [Boiardi Products Corporation; a QEP company]
- c. [Bostik; Arkema]
- d. [C-Cure]
- e. [Custom Building Products]
- f. [H.B. Fuller Construction Products Inc. / TEC]
- g. [Laticrete International, Inc.]
- h. [MAPEI Corporation]
- i. [Parex, a Sika brand]
- j. [Sakrete; CRH Americas, Oldcastle APG]
- k. [Siena Tile & Stone Installation Products; Omega Products International]
- l. [Sika Corporation]
- m. [Southern Grouts & Mortars, Inc]
- n. [Summitville Tiles, Inc.]

- C. Grout for PregROUTed Tile Sheets: Same product used in factory to pregROUT tile sheets.

2.9 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting and adhesive materials for installations indicated.
- B. Vapor-Retarder Membrane: Polyethylene sheeting, ASTM D4397, 4.0 mils thick.
- C. Metal Edge Trim: Profile designed for wall terminations and edge protection.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Schluter Systems L.P.]
 - b. <Insert manufacturer's name>
 - 2. Description: [L-shaped][Square][Beveled]<Insert profile>.
 - 3. Terminations: [End caps][Inside corners][Outside corners] matching edge-protection profile.
 - 4. Material and Finish: [Chrome-plated brass][Polished chrome anodized aluminum][Polished nickel anodized aluminum][Color-coated aluminum]<Insert finish> exposed-edge material.
 - a. Color: TBD
- D. Temporary Protective Coating: Formulated to protect exposed surfaces of tile against adherence of mortar and grout; compatible with tile, mortar, and grout products and easily removable after grouting is completed without damaging grout or tile.

- E. 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.
- F. Grout Sealer: Grout manufacturer's standard product for sealing grout joints that does not change color or appearance of grout.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
 - 2. Verify that concrete substrates for tile floors installed with [adhesives][bonded mortar bed][or][thinset mortar] comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. 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.
 - 4. 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.

3.2 PREPARATION

- A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.
- B. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with [adhesives][or][thinset mortar] with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- C. Where indicated, prepare substrates to receive waterproof membrane by applying a reinforced mortar bed that complies with ANSI A108.1 and is sloped 1/4 inch per foot toward drains.

- D. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.
- E. Substrate Flatness:
 - 1. For tile shorter than 15 inches, confirm that structure or substrate is limited to variation of 1/4 inch in 10 ft. from the required plane, and no more than 1/16 inch in 12 inches when measured from tile surface high points.
 - 2. For large format tile, tile with at least one edge 15 inches or longer, confirm that structure or substrate is limited to 1/8 inch in 10 ft. from the required plane, and no more than 1/16 inch in 24 inches when measured from tile surface high points.
- F. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION OF CERAMIC TILE SYSTEM

- A. Install tile backing panels and treat joints in accordance with ANSI A108.11 and manufacturer's written instructions for type of application indicated.
- B. Install waterproof membrane to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow waterproof membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.
 - 1. Allow crack isolation membrane to cure before installing tile or setting materials over it.
- D. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.
 - 1. Add materials, water, and additives in accurate proportions.
 - 2. 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.
- E. Install tile in accordance with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of ANSI A108 series that are referenced in TCNA installation

methods and specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors and walls.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles 8 by 8 inches or larger.
 - f. Tile floors consisting of rib-backed tiles.
 2. 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.
 3. 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.
 4. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
 5. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
 6. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - a. 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.
 - b. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
 - c. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
 7. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- F. Movement Joints: Provide movement joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated on Drawings. Form joints during installation of setting materials, mortar beds, and tile. Keep joints free of dirt, debris, and setting materials prior to filling with sealants. Do not saw-cut joints after installing tiles.
1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.

- G. Thresholds: Install stone and solid surface thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in [modified dry-set][improved modified dry-set] mortar (thinset).
 - 2. Do not extend [cleavage membrane][waterproof membrane][or][crack isolation membrane] under thresholds set in [standard dry-set][modified dry-set][or][improved modified dry-set] mortar. Fill joints between such thresholds and adjoining tile set on [cleavage membrane][waterproof membrane][or][crack isolation membrane] with elastomeric sealant.
- H. Metal Flooring Transitions: Install [at locations indicated][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile][where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with or below top of tile and no threshold is indicated].
- I. Metal Wall Trim: Install at locations indicated on Drawings.
- J. Grout Sealer: Apply grout sealer to[cementitious] grout joints[in tile floors] in accordance with manufacturer's written instructions. As soon as sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.

3.4 FIELD QUALITY CONTROL

- A. Water Test:
 - 1. Test of waterproofing membrane in showers and similar areas to be performed by Installation Contractor before setting tile.
 - a. Perform test after 24 hours of waterproof membrane installation.
 - b. Insert test plug in drain or waste line.
 - c. Fill shower base with water, high enough that the membrane-to-drain connection and floor-to-wall transition can be evaluated, and mark wall.
 - d. Check for leaks after 24 hours.
 - 2. Test to be witnessed by [Architect][authorities having jurisdiction]<Insert names or titles of witnesses>.
- B. Nonconforming Work:
 - 1. Waterproof membrane will be considered defective if water level has dropped.
 - 2. Remove and replace defective components and retest.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

- B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
 - 1. Remove grout residue from tile as soon as possible.
 - 2. Clean grout smears and haze from tile in accordance with tile and grout manufacturer's written instructions. 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.

3.6 PROTECTION

- A. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR CERAMIC TILE INSTALLATION SCHEDULE

- A. Interior Floor Installations, Concrete Subfloor:
 - 1. TCNA F111 <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) installed over cleavage membrane.
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
 - c. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement] grout.
 - d. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - e. Movement Joints: Types located on Drawings.
 - 2. TCNA F125-Full <Insert designation>: Thinset mortar on crack isolation membrane.
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [Modified dry-set][Improved modified dry-set] mortar.
 - c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Crack Isolation Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied

- membrane][Fabric-reinforced, fluid-applied membrane].
- e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
- f. Movement Joints: Types located on Drawings.

B. Interior Wall Installations, Masonry or Concrete:

1. TCNA W202I <Insert designation>: Thinset mortar[over waterproof membrane].
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [Dry-set][Modified dry-set][Improved modified dry-set][Water-cleanable epoxy] mortar.
 - c. Grout: [Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - f. Movement Joints: Types located on Drawings.
2. TCNA W211 <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) bonded to substrate[over waterproof membrane].
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
 - c. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - f. Movement Joints: Types located on Drawings.

C. Interior Wall Installations, Wood or Metal Studs or Furring:

1. TCNA W242 <Insert designation>: Organic adhesive on gypsum board.
 - a. Ceramic Tile Type: <Insert tile-type designation>.
 - b. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
 - c. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - d. Movement Joints: Types located on Drawings.
2. TCNA W245 <Insert designation>: Thinset mortar on glass-mat, water-resistant gypsum backer board[over waterproof membrane].
 - a. Ceramic Tile Type: <Insert tile-type designation>.

- b. Thinset Mortar: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
- c. Grout: [Sand-portland cement][Standard sanded cement][Standard unsanded cement][High-performance sanded cement][High-performance unsanded cement][Water-cleanable epoxy] grout.
- d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
- e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
- f. Movement Joints: Types located on Drawings.

3.8 CHEMICAL-RESISTANT TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete:

- 1. TCNA F115 <Insert designation>: Thinset mortar[over crack isolation membrane].
 - a. Chemical-Resistant Tile Type: <Insert tile-type designation>.
 - b. Thinset Mortar: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
 - c. Grout: [Water-cleanable epoxy][Chemical-resistant furan].
 - d. Crack Isolation Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Asphaltic sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - f. Movement Joints: Types located on Drawings.
- 2. TCNA F131 <Insert designation>: Water-cleanable, tile-setting epoxy.
 - a. Chemical-Resistant Tile Type: <Insert tile-type designation>.
 - b. Grout: Water-cleanable epoxy.
 - c. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - d. Movement Joints: Types located on Drawings.

B. Interior Wall Installations, Masonry or Concrete:

- 1. TCNA W211 <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. Cement mortar bed (thickset) bonded to substrate[over waterproof membrane].
 - a. Chemical-Resistant Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Latex-] portland cement mortar.
 - c. Grout: Water-cleanable epoxy.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - f. Movement Joints: Types located on Drawings.

C. Interior Wall Installations, Solid Backing:

1. TCNA W222 <Insert designation>: Method [ANSI A108.1A][ANSI A108.1B][ANSI A108.1C]. One-coat cement mortar bed (thickset) installed[over cleavage membrane][over waterproof membrane] on solid backing.
 - a. Chemical-Resistant Tile Type: <Insert tile-type designation>.
 - b. Bond Coat for Cured-Bed Method: [Dry-set][Modified dry-set][Improved modified dry-set] mortar.
 - c. Grout: Water-cleanable epoxy.
 - d. Waterproof Membrane: [As recommended by setting material manufacturer][Polyethylene sheet][Fluid-applied membrane][Fabric-reinforced, fluid-applied membrane].
 - e. Joint Width: [1/8 inch][3/16 inch][1/4 inch][3/8 inch]<Insert width>.
 - f. Movement Joints: Types located on Drawings.

END OF SECTION 09 30 13

SECTION 09 51 13 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical panels.
2. Metal suspension system.
3. Metal edge moldings and trim.

B. Related Requirements:

1. Section 095123 "Acoustical Tile Ceilings" for ceilings consisting of mineral-base acoustical tiles used with fully concealed suspension systems, stapling, or adhesive bonding.
2. Section 095133 "Acoustical Metal Pan Ceilings" for ceilings consisting of metal-pan units with exposed and concealed suspension systems.

C. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party-Certified Life-Cycle Assessment: For each product.

C. Samples: For each exposed product and for each color and texture specified, 6 inches in size.

D. Samples for Initial Selection: For components with factory-applied finishes.

E. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Panels: Set of [full-size][6-inch- square]<Insert size> Samples of each

- type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of [6-inch-]<Insert dimension> long Samples of each type, finish, and color.
 - 3. Clips: Full-size [hold-down][impact][and][seismic] clips.
- F. Delegated Design Submittals: For seismic restraints for ceiling systems.
- 1. Include design calculations for seismic restraints including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
- 1. Ceiling suspension-system members.
 - 2. Structural members to which suspension systems will be attached.
 - 3. Method of attaching hangers to building structure.
 - a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.
 - 4. Carrying channels or other supplemental support for hanger-wire attachment where conditions do not permit installation of hanger wires at required spacing.
 - 5. Size and location of initial access modules for acoustical panels.
 - 6. Items penetrating finished ceiling and ceiling-mounted items including the following:
 - a. Lighting fixtures.
 - b. Diffusers.
 - c. Grilles.
 - d. Speakers.
 - e. Sprinklers.
 - f. Access panels.
 - g. Perimeter moldings.
 - h. <Insert item>.
 - 7. Show operation of hinged and sliding components covered by or adjacent to acoustical panels.
 - 8. Minimum Drawing Scale: [1/4 inch = 1 foot][1/8 inch = 1 foot][1:50][1:100]<Insert scale>.
- B. Qualification Data: For testing agency.
- C. Product Test Reports: For each acoustical panel ceiling, for tests performed by [manufacturer and witnessed by a qualified testing agency][a qualified testing agency].
- D. Evaluation Reports: For each acoustical panel ceiling suspension system[and anchor

and fastener type], from ICC-ES.

- E. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, from the same production run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Units: Full-size panels equal to [2]<Insert number> percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to [2]<Insert number> percent of quantity installed.
 - 3. Hold-Down Clips: Equal to [2]<Insert number> percent of quantity installed.
 - 4. Impact Clips: Equal to [2]<Insert number> percent of quantity installed.

1.7 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockup of typical ceiling area as indicated on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above

ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Source Limitations for Ceiling System: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design seismic restraints for ceiling systems.
- B. Seismic Performance: Suspended ceilings to withstand the effects of earthquake motions determined in accordance with [ASCE/SEI 7]<Insert requirement>.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Flame-Spread Index: Class [A][B][C] in accordance with ASTM E1264.
 2. Smoke-Developed Index: [50][450]<Insert value> or less.
- D. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL or from the listings of another qualified testing agency.

2.3 ACOUSTICAL PANELS

- A. Acoustical Panels:
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Gypsum]
 - b. [Armstrong World Industries]
 - c. [Cardinal Acoustics, Inc.]
 - d. [CertainTeed; SAINT-GOBAIN]
 - e. [Rockfon; ROCKWOOL International]
 - f. [USG Corporation]

- g. <Insert manufacturer's name>
- 2. Acoustical Panel Standard: Provide manufacturer's standard panels in accordance with ASTM E1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.
- 3. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- 4. Classification: Provide [fire-resistance-rated] panels as follows:
 - a. Type and Form, Type III: Mineral base with painted finish; [Form 1, nodular][Form 2, water felted][Form 4, cast or molded].
 - b. Type and Form, Type IV Form 1: Mineral base with membrane-faced overlay; Form 1, nodular; with [glass-fiber cloth][washable vinyl-film] overlay.
 - c. Type and Form, Type IV Form 2: Mineral base with membrane-faced overlay; Form 2, water felted; with [vinyl overlay on face][vinyl overlay on face and back][vinyl overlay on face, back, and sealed edges][fiberglass-fabric overlay on face].
 - d. Type and Form, Type XII: Glass-fiber base with membrane-faced overlay; [Form 1, plastic][Form 2, cloth][Form 3, other]. Binder may not contain urea formaldehyde.
 - e. Type and Form, Type XX: High-density, ceramic- and mineral-base panels with scrubbable finish, resistant to heat, moisture, and corrosive fumes.
 - f. Type and Form: <Insert type and form>.
 - g. Pattern: [C (perforated, small holes)][CD (perforated, small holes and fissured)][CE (perforated, small holes and lightly textured)][D (fissured)][E (lightly textured)][F (heavily textured)][G (smooth)][GH (smooth and printed)][I (embossed)][J (embossed-in-register)][K (surface scored)][Z (other patterns as described)][and][as indicated by manufacturer's designation]<Insert pattern>.
- 5. Color: [White][As selected from manufacturer's full range][Match Architect's sample][As indicated by manufacturer's designation][As indicated on Drawings][As indicated in a schedule]<Insert color>.
- 6. Light Reflectance (LR): Not less than [LR indicated in a schedule][0.65][0.70][0.75][0.80][0.85][0.90]<Insert LR>.
- 7. Ceiling Attenuation Class (CAC): Not less than [CAC indicated in a schedule][20][25][30][35][40]<Insert CAC>.
- 8. Noise Reduction Coefficient (NRC): Not less than [NRC indicated in a schedule][0.40][0.50][0.55][0.60][0.65][0.70][0.75][0.80][0.85][0.90][0.95][1.00]<Insert NRC>.
- 9. Articulation Class (AC): Not less than [AC indicated in a schedule][170][180][190][200][210]<Insert AC>.
- 10. Edge/Joint Detail: [Square][Reveal sized to fit flange of exposed suspension-system members][Flush reveal sized to fit flange of exposed suspension-system members][Beveled, kerfed, and rabbeted long edges and square, butt-on short edges][As indicated by manufacturer's designation]<Insert requirement>.
- 11. Thickness: [5/8 inch][3/4 inch][7/8 inch][1 inch][1-1/2 inches][As indicated on Drawings][As indicated in a schedule]<Insert dimension>.
- 12. Modular Size:
[24 by 24 inches][24 by 48 inches][24 by 72 inches][24 by 96 inches][48 by 48 inc

hes][600 by 600 mm][600 by 1200 mm][As indicated on Drawings][As indicated in a schedule]<Insert size>.

13. Antimicrobial Treatment: Manufacturer's standard broad spectrum, antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested in accordance with ASTM D3273, ASTM D3274, or ASTM G21 and evaluated in accordance with ASTM D3274 or ASTM G21.

2.4 METAL SUSPENSION SYSTEM

A. Exposed Metal Suspension System:

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Armstrong World Industries]
 - b. [Cardinal Acoustics, Inc.]
 - c. [CertainTeed; SAINT-GOBAIN]
 - d. [Cipriani USA]
 - e. [Rockfon; ROCKWOOL International]
 - f. [USG Corporation]
 - g. <Insert manufacturer's name>
2. Metal Suspension-System Standard: Provide manufacturer's standard, direct-hung, metal suspension system and accessories in accordance with ASTM C635/C635M and designated by type, structural classification, and finish indicated.
 - a. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.
3. Wide-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16-inch-wide metal caps on flanges.
 - a. Fire Rating: [As indicated on Drawings]<Insert fire rating>.
 - b. Structural Classification: [Intermediate][Heavy]-duty system.
 - c. End Condition of Cross Runners: [Override (stepped)][or][butt-edge] type.
 - d. Face Design: Flat, flush.
 - e. Cap Material: [Cold-rolled steel][or][aluminum].
 - f. Cap Finish: [Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum].

4. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 9/16-inch-wide metal caps on flanges.
 - a. Structural Classification: [Intermediate][Heavy]-duty system.
 - b. End Condition of Cross Runners: [Override (stepped)][or][butt-edge] type.
 - c. Face Design: [Flat, flush][Flanges formed with an integral center reveal].
 - d. Cap Material: [Cold-rolled steel][or][aluminum].
 - e. Cap Finish: [Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation][Natural finish for aluminum].
5. Narrow-Face, Steel-Capped, Double-Web, Fire-Rated Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished, cold-rolled, 9/16-inch- wide metal caps on flanges.
 - a. Structural Classification: Intermediate-duty system.
 - b. Face Design: Flat, flush.
 - c. Cap Finish: [Painted white][Painted in color as selected from manufacturer's full range][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Plated with metallic finish as selected from manufacturer's full range][Plated with metallic finish indicated by manufacturer's designation].
6. Narrow-Face, Uncapped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; to produce structural members with 9/16-inch- wide faces.
 - a. Structural Classification: [Intermediate][Heavy]-duty system.
 - b. Face Design: [With 1/8-inch- wide, slotted, box-shaped flange][With 1/4-inch-wide, slotted, box-shaped flange][Flanges formed in stepped design with a center protrusion projecting 19/64 inch below flange surfaces supporting panel faces and forming 3/16-inch- wide reveals between edges of protrusion and those of panels].
 - c. Face Finish: Painted [white][in color as selected from manufacturer's full range][to match color indicated by manufacturer's designation][to match color of acoustical unit].
 - d. Reveal Finish: Painted [to match flange color][white][black][in color other than flange color as selected from manufacturer's full range of contrasting reveal colors].
7. Wide-Face, Aluminum-Capped, Double-Web, Hot-Dip Galvanized, G60 (Z180), Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized, G60 coating designation; with prefinished, 15/16-inch-wide aluminum caps on flanges.

- a. Fire Rating: [As indicated on the Drawings]<Insert fire rating>.
 - b. Structural Classification: [Intermediate][Heavy]-duty system.
 - c. Face Design: Flat, flush.
 - d. Cap Finish: [Painted white][Painted to match color indicated by manufacturer's designation][Painted to match color of acoustical unit][Natural finish].
8. Wide-Face, Single-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet electrolytically zinc coated, with prefinished flanges of width indicated.
 - a. Structural Classification: Heavy-duty system.
 - b. Face Finish: Painted [white][black].
9. Wide-Face, Capped, Double-Web, Stainless Steel Suspension System: Main and cross runners roll formed from Type 304 or 316 stainless steel sheet, with prefinished 15/16-inch- wide, stainless steel caps on flanges.
 - a. Structural Classification: Intermediate-duty system.
 - b. Face Design: Flat, flush.
10. Narrow-Face, Single-Web, Extruded-Aluminum Suspension System: Main and cross runners formed from extruded aluminum to produce structural members with 9/16-inch- wide faces.
 - a. Structural Classification: [Intermediate][Heavy]-duty system.
 - b. Face Design: Screw-slot profile.
 - c. Face Finish: [Painted white][Satin anodized in accordance with AAMA 611, AA-M12C22A31].
 - d. Reveal Finish: [Match face finish][Painted white][Painted black].
11. Extra-Wide-Face, Metal Suspension System: Main and cross runners formed from [extruded aluminum][aluminum-capped steel][steel-capped steel]<Insert description> to produce structural members with [1-1/2-inch-][2-inch-] wide flanges.
 - a. Structural Classification: [Intermediate][Heavy]-duty system.
 - b. Face Design: Flat, flush.
 - c. Face Finish: [Painted white][Satin anodized in accordance with AAMA 611, AA-M12C22A31].
 - d. Gasket System: Clean-room type.

2.5 ACCESSORIES

- A. Attachment Devices: Size for five times the design load indicated in ASTM C635/C635M, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.
 1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain,

without failure, a load equal to [five]<Insert safety factor> times that imposed by ceiling construction, as determined by testing in accordance with ASTM E488/E488M or ASTM E1512 as applicable, conducted by a qualified testing and inspecting agency.

- a. Type: [Cast-in-place][Postinstalled expansion][Postinstalled bonded] anchors.
 - b. Corrosion Protection, Carbon Steel: Components zinc plated in accordance with ASTM B633, Class SC 1 (mild) service condition.
 - c. Corrosion Protection, Stainless Steel: Components complying with ASTM F593 and ASTM F594, Group 1 Alloy 304 or 316.
 - d. Corrosion Protection, Nickel-Copper Alloy: Components fabricated from nickel-copper-alloy rods complying with ASTM B164 for UNS No. N04400 alloy.
2. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to [10]<Insert safety factor> times that imposed by ceiling construction, as determined by testing in accordance with ASTM E1190, conducted by a qualified testing and inspecting agency.
- B. Wire Hangers, Braces, and Ties: Provide wires as follows:
1. Zinc-Coated, Carbon-Steel Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper.
 2. Stainless Steel Wire: ASTM A580/A580M, Type 304, nonmagnetic.
 3. Nickel-Copper-Alloy Wire: ASTM B164, nickel-copper-alloy UNS No. N04400.
 4. Size: Wire diameter sufficient for its stress at three times hanger design load (ASTM C635/C635M, Table 1, "Direct Hung") will be less than yield stress of wire, but not less than [0.106-inch-][0.135-inch-]<Insert dimension> diameter wire.
- C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized-steel sheet complying with ASTM A653/A653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Hold-Down Clips: Manufacturer's standard hold-down.
- G. Impact Clips: Manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.
- H. Seismic Clips: Manufacturer's standard seismic clips designed to secure acoustical panels in place during a seismic event.
- I. Seismic Stabilizer Bars: Manufacturer's standard perimeter stabilizers designed to

accommodate seismic forces.

- J. Seismic Struts: Manufacturer's standard compression struts designed to accommodate seismic forces.
- K. Clean-Room Gasket System: Where indicated, provide manufacturer's standard system, including [manufacturer's standard][closed-cell PVC][neoprene][antimicrobial] gasket and related adhesives, tapes, seals, and retention clips, designed to seal out foreign material from and maintain positive pressure in clean room.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Metal Edge Moldings and Trim:

- 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Armstrong World Industries]
 - b. [CertainTeed; SAINT-GOBAIN]
 - c. [Cipriani USA]
 - d. [Rockfon; ROCKWOOL International]
 - e. [USG Corporation]
 - f. <Insert manufacturer's name>
- 2. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
 - a. Edge moldings to fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
 - b. For lay-in panels with reveal edge details, provide [stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member]<Insert description>.
 - c. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
- 3. Extruded-Aluminum Edge Moldings and Trim: Where indicated, provide manufacturer's extruded-aluminum edge moldings and trim of profile indicated or referenced by manufacturer's designations, including splice plates, corner pieces, and attachment and other clips, complying with seismic design requirements.
 - a. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
 - b. Baked-Enamel or Powder-Coat Finish: Minimum dry film thickness of 1.5 mils. Comply with ASTM C635/C635M and coating manufacturer's

written instructions for cleaning, conversion coating, and applying and baking finish.

2.7 ACOUSTICAL SEALANT

- A. Acoustical Sealant: As specified in Section 079219 "Acoustical Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.
- B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF ACOUSTICAL PANEL CEILINGS

- A. Install acoustical panel ceilings in accordance with ASTM C636/C636M[, seismic design requirements,] and manufacturer's written instructions.
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems in accordance with tested fire-rated design.
- B. Suspend ceiling hangers from building's structural members and as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
 - 2. Splay hangers only where required[and, if permitted with fire-resistance-rated ceilings,] to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
 4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
 6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
 7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
 8. Do not attach hangers to steel deck tabs.
 9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
 10. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
 11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
1. Arrange directionally patterned acoustical panels as follows:

- a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to [long][short] axis of space.
 - c. Install panels in a basket-weave pattern.
2. For square-edged panels, install panels with edges fully hidden from view by flanges of suspension-system runners and moldings.
3. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
4. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
5. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
6. Install [hold-down][impact][and][seismic] clips in areas indicated; space in accordance with panel manufacturer's written instructions unless otherwise indicated.
 - a. Hold-Down Clips: Space [24 inches]<Insert dimension> o.c. on all cross runners.
7. Install clean-room gasket system in areas indicated, sealing each panel and fixture as recommended by panel manufacturer's written instructions.
8. Protect lighting fixtures and air ducts in accordance with requirements indicated for fire-resistance-rated assembly.

3.4 ERECTION TOLERANCES

- A. Suspended Ceilings: Install main and cross runners level to a tolerance of [1/8 inch in 12 feet]<Insert dimensions>, non-cumulative.
- B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of [1/8 inch in 12 feet]<Insert dimensions>, non-cumulative.

3.5 FIELD QUALITY CONTROL

- A. Special Inspections: [Owner will engage][Engage] a qualified special inspector to perform the following special inspections:
 1. Periodic inspection during the installation of suspended ceiling grids in accordance with ASCE/SEI 7.
- B. Testing Agency: [Owner will engage][Engage] a qualified testing agency to perform tests and inspections.
- C. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages and when

installation of ceiling suspension systems on each floor has reached 20 percent completion, but no panels have been installed. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations of acoustical panel ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 bf of tension.
 2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- D. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports.

3.6 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.
- B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 09 51 13

DIVISION 09 - FINISHES

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

BEGINNING OF SECTION

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes but not limited to the following: Resilient Stair Tread and Risers
- B. Attention is directed to the CONTRACT AND GENERAL CONDITIONS and all Sections within DIVISION 01 - GENERAL REQUIREMENTS which are hereby made a part of this Section of the Specifications.

1.2 REFERENCES

- A. **Work Included:** Provide labor, materials and equipment necessary to complete the work of this Section, including but not limited to the following:
 - i. Resilient Stair Tread and Risers
 - ii. Adhesives and accessories required for installation
 - iii. Substrate preparation
- B. **Related Work:** The following items are not included in this Section and are specified under the designated Sections:
 - i. Section 03 30 00 CAST-IN-PLACE CONCRETE for concrete substrate; slab surface tolerances
 - ii. Section 06 10 00 ROUGH CARPENTRY for plywood substrate and surface tolerances
 - iii. Section 09 01 60 MAINTENANCE OF FLOORING for resilient floor covering care and upkeep
 - iv. Section 09 69 00 ACCESS FLOORING for resilient floor covering for access panels
- C. **References (Industry Standards):**
 - i. **ASTM International (ASTM):**
 - a. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
 - b. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
 - c. ASTM D2047 - Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine
 - d. ASTM F2169 - Standard Specification for Resilient Stair Treads
 - e. ASTM D2240 - Standard Test Method for Rubber Property – Durometer Hardness
 - f. ASTM F386 - Standard Test Method for Thickness of Resilient Flooring Materials Having Flat Surfaces
 - g. ASTM F1514 - Standard Test Method for Measuring Heat Stability of Resilient Flooring by Color Change

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- h. ASTM F925 - Standard Test Method for Resistance to Chemicals of Resilient Flooring
- i. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
- j. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
- k. ASTM F1482 - Standard Practice for Installation and Preparation of Panel Type Underlayments to Receive Resilient Flooring
- l. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- m. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
- n. ASTM F3191 - Standard Practice for Field Determination of Substrate Water Absorption (Porosity) for Substrates to Receive Resilient Flooring
- o. ASTM F3441 - Standard Guide for Measurement of pH Involving Resilient Flooring Installations
- p. ASTM F3311 - Standard Practice for Mat Bond Evaluation of Performance and Compatibility for Resilient Flooring System Components Prior to Installation
- ii. **National Fire Protection Association (NFPA):**
 - a. NFPA 253 - Test Method for Critical Radiant Flux of Floor Covering Systems Using a Radiant Energy Source
 - b. NFPA 258 - Test Method for Specific Density of Smoke Generated by Solid Materials
- iii. **Canadian Standards (CAN):**
 - a. CAN/ULC-S102.2 - Test Method for Surface Burning of Materials

1.3 SUBMITTALS

- A. **General:** Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedures.
- B. **Product Data:** Submit manufacturer's technical data sheet, care & maintenance document, submittal and/or warranty for each material and accessory proposed for use.
- C. **Samples:** Submit representative samples of each product specified for verification, in manufacturer's standard size samples of each resilient product color, texture and pattern required.

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

1.4 QUALITY ASSURANCE

- A. **Manufacturer Qualifications:** Provide resilient flooring materials manufactured in the United States of America by a firm with a minimum of 10 years' experience with resilient flooring materials of type equivalent to those specified.
 - i. Provide resilient flooring products, including wall base, accessories and subfloor preparation products from one manufacturer to ensure color matching and compatibility.
 - ii. Manufacturer shall be capable of providing technical training and technical field service representation.
- B. **Installer Qualifications:** Installer must be professional, licensed, insured and familiar with the resilient flooring material to be installed.
 - i. Minimum of five years experience in the installation of this resilient product type
 - ii. Project Managers, Field Supervisors, or Installers should hold current credentials by one or more of the following bodies:
 - a. NAFCT (National Association of Floor Covering Technicians)
 - b. INSTALL (International Standards & Training Alliance)
 - c. FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager)
 - d. CFI (Certified Floorcovering Installers)

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.
- B. Deliver materials sufficiently in advance of installation to condition materials to the required temperature for 48-hours prior to installation (unless otherwise stated in manufacturer's documentation).

1.6 PROJECT CONDITIONS

- A. Install Resilient flooring after other finishing operations, including painting, have been completed.
- B. Maintain temperature at service levels and/or the ambient temperature must remain steady ($\pm 10^{\circ}$ F) between 60° F and 85° F for at least 48-hours prior to, during and until substantial completion.
- C. Maintain relative humidity at service levels, or between 35% and 65% RH.
- D. Avoid conditions in which dew point causes condensation on the installation surface.

1.7 WARRANTY

- A. Provide manufacturer's job or project specific commercial warranty covering manufacturing defects for the stated standard warranty length
- B. Provide installer's standard warranty in which installer agrees to repair or replace resilient flooring that fails due to poor workmanship or faulty installation within the specified warranty period

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SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

- i. Warranty Period: Two (2) years from Date of Substantial Completion

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis-of-Design: Six Degrees Flooring Surfaces | 1600 N Union St. | Fostoria, OH 44830 | P: (844) 432-5885
- B. Substitutions: No substitutions permitted
- C. Substitution Limitations:
 - i. All other manufacturers: Submit formal substitution request prior to bid in accordance with Section 01 25 00 - "Substitution Procedures"
 - ii. Approval of other manufacturer does not relieve the Flooring Contractor of responsibility to provide products which comply with all requirements of this specification

2.2 MATERIALS

- A. IMPRESSION LVT STAIR TREADS
 - i. Color and Pattern
 - a. Color Selected: *See finish legend*
(treads with visual stripe) [IS220_C12S Birmingham] [IS221_C36S San Francisco] [IS236_C13S Portland] [IS330_C02S Cleveland] [IS406_C09S Park City] [IS330_C22S Omaha] [IS545_C01S Wilmington]
 - b. Size: Length as needed per site measurements. See finish legend for preferred size
 - c. Thickness: 3 mm
 - d. Surface Finish: Embossed with UV Cured Ceramic Reinforced Urethane
 - e. Wear Layer Thickness: Nominal 28 mil (0.7 mm)
 - ii. Performance Criteria:
 - a. ASTM F2169 - Resilient Stair Treads (*With visual stripe*)[Type TV, Class 2, Group 2]
 - b. ASTM F648/NFPA 253 - Critical Radiant Flux; Class 1, > 0.45 W/cm²
 - c. ASTM F662/NFPA 258 - Smoke Density; ≤ 450
 - d. CAN/ULC-S102.2 - Surface Burning; 50 FSR & 150 SDC
 - e. ASTM D2047 - Static Coefficient of Friction; ≥ 0.50
 - f. ASTM F1514 - Heat Stability; ΔE ≤ 8
 - g. Environmental Product Declaration (EPD) Available

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- h. Contributes to LEED v4/4.1 Requirements
- i. Achieved NSF/ANSI 332 Level 1 Certification
- j. Achieved GreenGuard Gold Certification
- k. Achieved FloorScore Certification
- l. Meets California Department of Public Health V1.2 (CA Section 01350) requirements
- m. Meets Collaborative for High Performance Schools (CHPS) requirements
- n. Does Not Contain Recycled Materials
- o. Qualifies for American Made Products Acts and/or Requirements
- p. Ten (10) year Limited Commercial Warranty

2.3 ACCESSORIES

- A. **Moisture Mitigation:** Moisture testing is required for all resilient flooring installations. Mitigation should be performed if results indicate high moisture levels. Refer to manufacturers Technical department for additional information if needed
- B. **Substrate Preparation Products:** Substrates should be prepared to properly receive the resilient flooring products being specified. Trowelable leveling and patching compounds that are latex-modified, Portland cement based or blended hydraulic cement based formulation as recommended by manufacturer
- C. **Adhesives:** Adhesives as recommended by manufacturer and selected based on the site conditions and use of the space being installed
 - i. Excelsior EN-610 Epoxy Nose Filler Required for Installation
- D. **Transitions, reducers, edge strips, and moldings:** Compatible with flooring and as recommended by manufacturer
 - i. Optional J Channel Accessory can be utilized for the area where the Tread and Riser portion come together.

PART 3 – EXECUTION

3.1 GENERAL

- A. **General Contractor Responsibilities:**
 - i. Supply a safe, climate controlled building and subfloor as detailed in Roppe Technical Data Sheets.
 - ii. Provide a secure storage area that is maintained permanently or temporarily at normal operating temperature and humidity conditions between 65° F and 85° F and between 40% and 65% relative humidity, for at least 48-hours prior to and during the application of the flooring, so the flooring contractor can acclimate the flooring materials per manufacturer's instructions.

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- iii. Provide an installation area that is weather tight and maintained either permanently or temporarily at ambient service temperature and humidity. Normal operating temperature and humidity conditions are between 65° F and 85° F and between 40% and 65% relative humidity, for at least 48-hours before and during the application of the flooring per the manufacturer's instructions.
 - iv. Ensure areas with direct prolonged exposure to sunlight are protected with protective UVA/UVB restrictive coatings or films.
 - v. Areas of the flooring that are subject to direct sunlight through doors or windows should have them covered using blinds, curtains, cardboard or similar for the time of the installation and 72-hours after the installation to allow the adhesive to cure. Note: These areas should be installed using wet adhesives only.
- B. Flooring Contractor Responsibilities:**
- i. Provide trained installers that are professional, licensed, insured and familiar with the resilient flooring material to be installed.
 - ii. Ensure installers or installation teams meet one of the following requirements:
 - a. Have completed INSTALL (International Standards & Training Alliance) or CFI (Certified Floorcovering Installers) training programs and/or are certified by INSTALL or CFI.
 - b. Are being supervised by Project Managers or Field Supervisors that are INSTALL (International Standards & Training Alliance) certified.
 - c. CFI (Certified Floorcovering Installers) Certified and/or an FCICA (The Flooring Contractors Association) CIM (Certified Installation Manager).
 - iii. Follow all requirements in the appropriate Technical Data Sheets, Installation Instructions, Care & Maintenance Documents, Warranties and/or other technical documents or instructions.

3.2 EXAMINATION

- A. **General:** Follow guidelines laid out in Division 01, Section 01 71 00 – Examination and Preparation, and Section 01 43 00 – Quality Assurance.
- B. **Verification of Conditions:** Inspect all substrates to ensure they are clean, smooth, permanently dry, flat, and structurally sound. Confirm all areas are properly sealed and acclimated per manufacturer's requirements.
- C. **Verification of Products:** In accordance with manufacturer's installation requirements, visually inspect material for size, color or visual defects prior to installing. Any material that is incorrect or visually defective shall not be installed.

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3.3 PREPARATION

- A. **General:** Follow guidelines laid out in Division 01, Section 01 71 00 – Examination and preparation. All work required, ensuring substrate or subfloor meets manufacturers' guidelines are the responsibility of the general contractor.
- B. **Preparation:** Ensure substrate meets the requirements of ASTM F710 for concrete substrates and ASTM F1482 for wood substrates and/or Roppe Technical Data Sheets and Excelsior Technical Data Sheets.
 - i. Substrates must be free of visible water or moisture, dust, sealers, paint, sweeping compounds, curing compounds, residual adhesives and adhesive removers, concrete hardeners or densifiers, solvents, wax, oil, grease, asphalt, visible alkaline salts or excessive efflorescence, mold, mildew and any other extraneous coating, film, material or foreign matter.
 - ii. It is recommended that all substrates have a floor flatness of FF32 and/or flatness tolerance of 1/8" in 6' or 3/16" in 10'.
 - iii. Acclimate all products to be used during the installation and the installation environment prior to installation according to the manufacturers written instructions
- C. **Concrete Substrates:**
 - i. **Moisture Testing:** Perform moisture testing per the manufacturer's recommendations to determine conditions, it is recommended to treat new and existing slabs a little bit differently to ensure adequate conditions exist for installation.
 - a. New Slabs on all grade levels: it is recommended to perform ASTM F2170 Relative Humidity testing no more than a week prior to installation to determine the levels present and when to proceed with the installation.
 - b. Existing Slabs on all grade levels: in addition to ASTM F2170 testing, existing slabs that have previously had floor covering installed, must be tested to ASTM F1869 Calcium Chloride test kits to determine the MVER of the concrete.
 - ii. Mechanically remove contamination on the substrate that may cause damage to the flooring material. This includes paint, permanent and non-permanent markers, pens, crayons, etc. Leaving these on the substrate or marking with them on the back of the material could cause bleeding through and damage the flooring.
 - iii. Fill cracks, holes, depressions and irregularities in the substrate to prevent transferring through to the surface of the resilient flooring. Use a high-quality Portland cement based product such as Excelsior installation products provided by Roppe.
 - iv. Do not install material over expansion joints.
- D. **Wood Substrates:** wood substrates must have a minimum 18" (45.7 cm) of cross ventilated space beneath the joist.

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- i. Wood substrates must be a minimum 1" thick with a double layer construction.
- ii. Wood substrates must be rigid and free of movement
- iii. Wood substrates must not be OSB (Oriented Strand Board), particle board, chipboard, lauan or composite type underlayments
- iv. Wood substrates that are Single Wood or Tongue & Groove subfloors must be covered with the appropriate APA approved underlayment plywood:
 - a. Boards with a face width of 3" (7.62 cm) or less and are tongue-and-groove and with a smooth surface, use minimum 1/4" (6.4 mm) underlayment panels.
 - b. Boards with a face width greater than 3" (7.62 cm) or not tongue-and-groove, or with a rough surface, use minimum 1/2" (12.7 mm) underlayment panels.

3.4 INSTALLATION

- A. **General:** Follow all relevant guidelines detailed in Division 01, and flooring and adhesive manufacturer's technical data sheets.
- B. **Resilient Stair Treads:** Install material in accordance with manufacturer's recommendations:
 - i. Select the appropriate adhesive for the application and job site conditions.
 - ii. Layout material in accordance with manufacturer recommendations unless otherwise directed in specification documents.
 - iii. Ensure material is rolled appropriately into the adhesive using a 100 lb. three section roller.

3.5 CLEANING & PROTECTION

- A. **General:** Clean up installation area and sweep, dust or wipe material to remove any dirt, dust or debris.
- B. **After Installation:**
 - i. Remove adhesive and other blemishes from exposed surfaces.
 - ii. Sweep and vacuum surfaces thoroughly.
 - iii. Damp-mop surfaces to remove marks and soil.
 - iv. Protect resilient products from marks, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during the remainder of construction period.
- C. **Post Installation Prior To Service Maintenance:** Conduct Post Installation Prior to Service Maintenance per the manufacturer's recommended procedures stated in the Care & Maintenance Documents.
- D. **Regular/Routine Maintenance:** Begin a regular maintenance program after performance of the Post Installation Prior to Service Maintenance is performed.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic rubber base.
2. Rubber molding accessories.
3. Vinyl molding accessories.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
3. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.
5. Section 096813 "Tile Carpeting" for modular carpet tile flooring.
6. Section 096816 "Sheet Carpeting" for tufted and woven carpet flooring.
7. Section 104513 "Photoluminescent Egress Path Markings" for luminous stair accessories.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference [at Project site][by web conference]<Insert location>.

1. Review methods and procedures related to resilient base and accessory installation including, but not limited to, the following:
 - a. Delivery, storage, and handling procedures.
 - b. Ambient conditions and ventilation procedures.
 - c. Subfloor preparation procedures for resilient stair accessories.
 - d. <Insert agenda items>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches long.

- C. Samples for Initial Selection: For each type of exposed product.
- D. Samples for Verification: For each type of exposed product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
- E. Product Schedule: For resilient base and accessory products.[Use same designations indicated on Drawings.]
- F. Sustainable Design Submittals:
 - 1. Third-Party Certifications: For each product.
 - 2. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For resilient base and accessory products, for tests performed by a qualified testing agency.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, from the same production run,] to Owner 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 ft.]<Insert dimension> for every [500 linear ft.]<Insert dimension> or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.6 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.8 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than [70 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>, in spaces to receive resilient products during the following periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than [55 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>.
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: As determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT BASE

- A. Thermoplastic Rubber Base:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Allstate Flooring]
 - b. [Armstrong Flooring, Inc.]
 - c. [Flexco Corporation]
 - d. [Forbo Flooring Systems]
 - e. [Roppe Corporation; Roppe Holding Company]
 - f. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 - g. [Tarkett USA]
 - h. [VPI Corporation]
 - i. <Insert manufacturer's name>
 - 2. Classification: ASTM F1861, Type TP (rubber, thermoplastic), Group [I (solid, homogeneous)][or][II (layered)].
 - 3. Style and Location:

- a. Style A, Straight: [Provide in areas with carpet]<Insert requirements>.
- b. Style B, Cove: [Provide in areas with resilient floor coverings]<Insert requirements>.
- c. Style C, Butt to: [Provide in areas indicated]<Insert requirements>.
- d. Style D, Sculptured: [Provide in areas indicated]<Insert requirements>.

1) Profile: [As indicated]<Insert requirement>.

- 4. Thickness: [0.125 inch][0.25 inch][0.375 inch]<Insert dimension>.
- 5. Height: [2-1/2 inches][4 inches][6 inches][As indicated on Drawings].
- 6. Lengths: [Cut lengths 48 inches long][Coils in manufacturer's standard length][Cut lengths 98 inches long or coils in manufacturer's standard length].
- 7. Outside Corners: [Job formed][Preformed][Job formed or preformed].
- 8. Inside Corners: [Job formed][Preformed][Job formed or preformed].
- 9. Colors: [As indicated by manufacturer's designations][Match Architect's sample]<Insert colors>.

2.3 RESILIENT MOLDING ACCESSORIES

A. Rubber Molding Accessories :

- 1. Accessory Description: [Stair-tread nosing][cap for cove carpet][cap for cove resilient floor covering][carpet bar for tackless installations][carpet edge for glue-down applications][nosing for carpet][nosing for resilient floor covering][reducer strip for resilient floor covering][joiner for tile and carpet][transition strips]<Insert description>.
- 2. Profile and Dimensions: [As indicated]<Insert profile and dimensions>.

B. Vinyl Molding Accessories :

- 1. Accessory Description: [Stair-tread nosing][cap for cove carpet][cap for cove resilient floor covering][carpet bar for tackless installations][carpet edge for glue-down applications][nosing for carpet][nosing for resilient floor covering][reducer strip for resilient floor covering][joiner for tile and carpet][transition strips]<Insert description>.
- 2. Profile and Dimensions: [As indicated]<Insert profile and dimensions>.

C. Locations: [Provide resilient molding accessories in areas indicated]<Insert requirements>.

D. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's sample]<Insert colors and patterns>.

2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

- B. Adhesives: Water-resistant type recommended in writing by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Metal Edge Strips: [Extruded aluminum with mill finish]<Insert requirements>, nominal 2 inches wide, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than [9][10]<Insert number> pH.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft.][1000 sq. ft.]<Insert area>, and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.

- a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft.]<Insert rate> in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until materials are the same temperature as space where they are to be installed.
 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 INSTALLATION OF RESILIENT BASE

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than [3 inches]<Insert dimension> in length.
 - a. Form without producing discoloration (whitening) at bends.
 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than [3 inches]<Insert dimension> in length.
 - a. [Miter][Cope][Miter or cope] corners to minimize open joints.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum horizontal surfaces thoroughly.
 - 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from resilient stair treads before applying liquid floor polish.
 - 1. Apply [one][two][three]<Insert number> coat(s).
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 09 65 13

SECTION 09 65 16 - RESILIENT SHEET FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Unbacked vinyl sheet flooring.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient sheet flooring.
3. Section 096519 "Resilient Tile and Plank Flooring" for modular resilient flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference [at Project site][by web conference]<Insert location>.

1. Review methods and procedures related to resilient sheet flooring installation including, but not limited to, the following:
 - a. Delivery, storage, and handling procedures.
 - b. Ambient conditions and ventilation procedures.
 - c. Subfloor preparation procedures.
 - d. <Insert agenda items>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation instructions for each type of substrate.

B. Shop Drawings: For each type of resilient flooring type required.

1. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
2. Show details of special patterns.

C. Samples: For each resilient flooring product and for each color, texture, and pattern specified, in manufacturer's standard size, but not less than [6-by-9-inch]<Insert

dimensions> sections.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than [9 inches]<Insert dimension> long, of each color required.

D. Samples for Initial Selection: For each type of resilient flooring product required.

E. Samples for Verification: For each type of resilient flooring product, in manufacturer's standard size, but not less than [6-by-9-inch]<Insert dimensions> sections of each color, texture, and pattern required.

1. Heat-Welding Bead: Include manufacturer's standard-size Samples, but not less than [9 inches]<Insert dimension> long, of each color required.

F. Welded-Seam Samples: For seamless-installation technique indicated and for each resilient flooring product, color, and pattern required; with seam running lengthwise and in center of [6-by-9-inch]<Insert dimensions> Sample applied to a rigid backing and prepared by Installer for this Project.

G. Product Schedule: For each type of resilient flooring product required.[Use same designations indicated on Drawings.]

H. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party-Certified Life-Cycle Assessment: For each product.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For resilient sheet flooring, for tests performed by a qualified testing agency.

B. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of resilient sheet flooring to include:

1. Methods for maintaining resilient sheet flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to resilient sheet flooring.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Material: Furnish extra materials[, from the same production run,] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Resilient Sheet Flooring: Full-width rolls equal to [5]<Insert number> percent of amount installed for each type, color, and pattern indicated, but not less than 10 sq. yd..

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient sheet flooring installation and seaming methods indicated.
 1. Engage an installer who employs workers for this Project who are trained or certified by resilient sheet flooring manufacturer for installation techniques required.

1.8 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups [as indicated on Drawings]<Insert mockup requirements>.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturers' labels indicating brand name and directions for storing.
- B. Store resilient sheet flooring and accessory materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store rolls upright.

1.10 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install resilient flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install resilient flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient flooring manufacturer.
- C. Adhesively Applied Products:

1. Maintain temperatures during installation within range recommended in writing by manufacturer, but not less than [70 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.
2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>.
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT SHEET FLOORING

- A. Unbacked Vinyl Sheet Flooring: Resilient sheet flooring product with wear layer that is printed or decorated, composed of fillers, pigments, and vinyl binders[, and protected by a clear specialty performance top layer].
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Armstrong Flooring, Inc.]
 - b. [Forbo Flooring Systems]
 - c. [Gerflor USA]
 - d. [Mannington Mills, Inc]
 - e. [Roppe Corporation; Roppe Holding Company]
 - f. <Insert manufacturer's name>
 2. Classification: ASTM F1913.
 3. Thickness: [0.080 inch]<Insert dimension>.
 4. Wearing Surface: [Smooth][Embossed].
 5. Sheet Width: [As standard with manufacturer][6 ft.][6.6 ft.]<Insert dimension>.
 6. Seamless Installation Method: [Heat welded][Chemically bonded]<Insert requirements>.
 7. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended in writing by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
- C. Seamless Installation Accessories:
 - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
 - a. Colors: [As selected by Architect from manufacturer's full range to contrast with flooring][Match flooring]<Insert colors>.
 - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.
- D. Integral-Flash-Cove-Base Accessories:
 - 1. Cove Strip: 1-inch radius provided or approved by resilient sheet flooring manufacturer.
 - 2. Cap Strip: [Square metal, vinyl, or rubber cap][Tapered vinyl cap]<Insert requirements> provided or approved by resilient sheet flooring manufacturer.
 - 3. Corners: Metal inside and outside corners and end stops provided or approved by resilient sheet flooring manufacturer.
- E. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient sheet flooring manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient sheet flooring.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient sheet flooring until materials are the same temperature as space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move flooring and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

3.3 INSTALLATION OF RESILIENT SHEET FLOORING

- A. Comply with manufacturer's written installation instructions.
- B. Unroll resilient sheet flooring and allow it to stabilize before cutting and fitting.
- C. Lay out resilient sheet flooring as follows:
 - 1. Maintain uniformity of flooring direction.
 - 2. Minimize number of seams; place seams in inconspicuous and low-traffic areas, at least 6 inches away from parallel joints in flooring substrates.

3. Match edges of flooring for color shading at seams.
 4. Avoid cross seams.
- D. Scribe and cut resilient sheet flooring to butt neatly and tightly to vertical surfaces and permanent fixtures, including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend resilient sheet flooring into toe spaces, door reveals, closets, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on resilient sheet flooring as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install resilient sheet flooring on covers for telephone and electrical ducts and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of flooring installed on covers and adjoining flooring. Tightly adhere flooring edges to substrates that abut covers and to cover perimeters.
- H. Adhere resilient sheet flooring to substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Seamless Installation:
1. Heat-Welded Seams: Comply with ASTM F1516. Rout joints and heat weld with welding bead to fuse sections permanently into a seamless flooring installation. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- J. Integral-Flash-Cove Base: Cove resilient sheet flooring [6 inches][to dimension indicated]<Insert dimension> up vertical surfaces. Support flooring at horizontal and vertical junction with cove strip. Butt at top against cap strip.
1. Install metal corners at inside and outside corners.
- 3.4 CLEANING AND PROTECTION
- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Perform the following operations immediately after completing resilient sheet flooring installation:
1. Remove adhesive and other blemishes from surfaces.

2. Sweep and vacuum surfaces thoroughly.
 3. Damp-mop surfaces to remove marks and soil.
- C. Protect resilient sheet flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
1. Apply [one][two][three]<Insert number> coat(s).
- E. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 09 65 16

SECTION 09 65 19 - RESILIENT TILE AND PLANK FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial luxury vinyl floor tiles.

B. Related Requirements:

1. Section 024119 "Selective Demolition" for removing existing floor coverings.
2. Section 096513 "Resilient Base and Accessories" for wall base and accessories installed with resilient tile and plank flooring.
3. Section 096516 "Resilient Sheet Flooring" for resilient rolled flooring.
4. Section 096543 "Linoleum Flooring" for modular and sheet linoleum flooring.

1.2 DEFINITIONS

- A. LVP: Luxury vinyl planks. A marketing term that is applied to modular resilient floor plank products.
- B. LVT: Luxury vinyl tiles. A marketing term that is applied to modular resilient floor tile products.
- C. VCT: Vinyl composition tiles. A modular resilient floor tile product composed of binder, fillers, and pigments.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.
 1. Review methods and procedures related to resilient tile and plank flooring installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.
 - d. <Insert agenda items>.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Include manufacturers' written data on physical characteristics, durability, and

- fade resistance.
 - 2. Include manufacturers' written installation instructions for each type of substrate.
 - B. Shop Drawings: For each type of resilient flooring type required.
 - 1. Include flooring layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
 - 2. Show details of special patterns.
 - C. Samples: Full-size units of each color, texture, and pattern of resilient flooring type required.
 - D. Samples for Initial Selection: For each type of resilient flooring product required.
 - E. Samples for Verification: Full-size units of each color and pattern of resilient flooring type required.
 - F. Product Schedule: For each type of resilient flooring product required.[Use same designations indicated on Drawings.]
 - G. Sustainable Design Submittals:
 - 1. Third-Party Certifications: For each product.
 - 2. Third-Party-Certified Life-Cycle Assessment: For each product.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Product Test Reports: For resilient flooring, for tests performed by a qualified testing agency.
 - B. Qualification Data: For Installer.
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For each type of resilient flooring product type to include:
 - 1. Methods for maintaining resilient flooring, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to resilient flooring.
- 1.7 MAINTENANCE MATERIAL SUBMITTALS
- A. Extra Stock Material: Furnish extra materials[, from the same production run,] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Resilient Tile and Plank Flooring: Furnish no fewer than [1 box for each 50

boxes]<Insert quantity> or fraction thereof, of each type, color, pattern, and size of resilient flooring product installed.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for resilient flooring installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by resilient flooring manufacturer for installation techniques required.

1.9 MOCKUPS

- A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Build mockups [as indicated on Drawings]<Insert mockup requirements>.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturers' labels indicating brand name and directions for storing.
- B. Store resilient flooring and accessory materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store resilient flooring on flat surfaces.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install resilient flooring until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.
- B. Do not install resilient flooring over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by resilient flooring manufacturer.
- C. Adhesively Applied Products:
1. Maintain temperatures during installation within range recommended in writing by

manufacturer, but not less than [70 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>, in spaces to receive flooring 48 hours before installation, during installation, and 48 hours after installation unless longer period is recommended in writing by manufacturer.

2. After postinstallation period, maintain temperatures within range recommended in writing by manufacturer, but not less than [55 deg F]<Insert temperature> or more than [95 deg F]<Insert temperature>.
3. Close spaces to traffic during flooring installation.
4. Close spaces to traffic for 48 hours after flooring installation unless manufacturer recommends longer period in writing.

1.12 WARRANTY

- A. Special Warranty for Resilient Flooring Products: Manufacturer agrees to repair or replace components of flooring installation that fail in materials or workmanship within specified warranty period.
 1. Warranty does not include deterioration or failure of flooring due to unusual traffic, failure of substrate, vandalism, or abuse.
 2. Warranty Period: [10]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products in accordance with ASTM E648 or ASTM E662 by a qualified testing agency.
 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 RESILIENT TILE AND PLANK FLOORING

- A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than <Insert number> percent.
- B. Commercial Luxury Vinyl Floor Tiles: Solid, resilient tile flooring product composed of binder, fillers, and pigments compounded with suitable stabilizers and processing aids; marketed as luxury vinyl tiles (LVT).
 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Altro]
 - b. [American Biltrite]
 - c. [Armstrong Flooring, Inc.]

- d. [Flexco Corporation]
 - e. [Gerflor USA]
 - f. [Mannington Mills, Inc]
 - g. [Mohawk Group]
 - h. [Roppe Corporation; Roppe Holding Company]
 - i. [Shaw Industries Group, Inc.; Berkshire Hathaway Company]
 - j. [Tarkett USA]
 - k. [van Gelder, Inc]
 - l. <Insert manufacturer's name>
2. Classification: ASTM F1700, Class [II, Surface-Decorated Vinyl Tile][III, Printed Film Vinyl Tile].
- a. Type: [A, Smooth Surface][B, Embossed Surface].
3. Overall Thickness: [0.080 inch][0.100 inch][0.120 inch][0.125 inch]<Insert dimension> including manufacturer's standard clear wear layer and UV-cured polyurethane topcoat.
4. Nominal Size: [12 by 12 inches][12 by 24 inches][18 by 18 inches][24 by 24 inches][36 by 36 inches][3 by 36 inches][6 by 48 inches][9 by 60 inches]<Insert dimensions>.
5. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples]<Insert colors and patterns>.
6. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended in writing by floor tile and adhesive manufacturers for substrate and conditions indicated.
- C. Vapor Retarder: ASTM D4397, polyethylene sheet not less than [6.0 mils][8.0 mils] thick.
- D. Asphalt-Saturated Felt: ASTM D4869/D4869M, Type II.
- E. Seamless-Installation Accessories: Manufacturer's standard product for chemically bonding seams.
- F. Floor Polish: Provide protective, liquid floor-polish products recommended by floor tile manufacturer.
- G. Joint Sealant for Resilient Terrazzo Floor Tile: Silicone sealant of type and grade recommended in writing by floor tile manufacturer to suit application.
 - 1. Joint-Sealant Color: [White][As selected by Architect from manufacturer's full

range to match floor tile][Match floor tile]<Insert color>.

- H. Sealers and Finish Coats for Resilient Terrazzo Floor Tile: Products recommended by floor tile manufacturer to suit application.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient flooring products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates in accordance with manufacturer's written installation instructions to ensure adhesion of flooring.
- B. Concrete Substrates: Prepare in accordance with ASTM F710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient flooring manufacturer. Do not use solvents.
 - 3. Alkalinity Testing: Perform pH testing in accordance with ASTM F710. Proceed with installation only if pH readings are not less than [7.0]<Insert value> and not greater than [8.5]<Insert value>.
 - 4. Moisture Testing: Perform tests so that each test area does not exceed [200 sq. ft.][1000 sq. ft.]<Insert area> and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Anhydrous Calcium Chloride Test: ASTM F1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of [3 lb of water/1000 sq. ft.]<Insert rate> in 24 hours.
 - b. Relative Humidity Test: Using in-situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum [75]<Insert number> percent relative humidity level measurement.

- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Move flooring and installation materials into spaces where they will be installed at least 48 hours in advance of installation unless manufacturer recommends a longer period in writing.
 - 1. Do not install flooring until it is the same temperature as space where it is to be installed.
- E. Sweep and vacuum clean substrates to be covered by flooring 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 INSTALLATION OF RESILIENT TILE AND PLANK FLOORING

- A. Comply with manufacturer's written installation instructions.
- B. Discard broken, cracked, chipped, or deformed tiles.
- C. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
 - 1. Lay tiles [square with room axis][at a 45-degree angle with room axis][in pattern indicated]<Insert requirements>.
- D. Tile Matching: Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered.
 - 1. Lay tiles [with grain running in one direction][with grain direction alternating in adjacent tiles (basket-weave pattern)][in pattern of colors and sizes indicated].
- E. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- F. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.
- G. 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 marking device.
- H. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in installation areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- I. Adhered Floor Tile: Adhere floor tiles to substrates using a full spread of adhesive applied to substrate to comply with adhesive and flooring manufacturers' written

installation instructions, including those for trowel notching, adhesive mixing, and adhesive open and working times, to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

- J. Floating Floor Tile: Install LVT floor tiles in accordance with flooring manufacturer's written installation instructions.
- K. Seamless Installation: Bond seams with chemical-bonding compound to fuse sections permanently into a seamless flooring installation. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.
- L. Resilient Terrazzo Accessories: Install in accordance with manufacturer's written instructions.

3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting flooring.
- B. Perform the following operations immediately after completing flooring installation:
 - 1. Remove adhesive and other blemishes from surfaces.
 - 2. Sweep and vacuum surfaces thoroughly.
 - 3. Damp-mop surfaces to remove marks and soil.
- C. Protect flooring from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, adhesive, and blemishes from flooring surfaces before applying liquid floor polish.
 - 1. Apply [one][two][three]<Insert requirements> coat(s).
- E. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.
- F. Sealers and Finish Coats: Remove soil, visible adhesive, and surface blemishes from resilient terrazzo floor tile surfaces before applying liquid cleaners, sealers, and finish products.
 - 1. Sealer: Apply two base coats of liquid sealer.
 - 2. Finish: Apply [two][three]<Insert requirements> coats of liquid floor finish.
 - a. Apply finish in accordance with manufacturer's written installation instructions to produce a sealed surface that is ready for use. Do not cover flooring after finishing until finish reaches full cure.
- G. Cover resilient flooring until Substantial Completion.

END OF SECTION 09 65 19

SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes carpet tile and installation.
- B. Related Sections include the following:
 - 1. Division 03 Section "Cast-in-Place Concrete": Curing compounds and other concrete treatments compatibility with carpet and carpet cushion adhesives.
 - 2. Division 03 Section "Hydraulic Cement Underlayment": Requirements for preparing existing concrete substrates.
 - 3. Division 09 Section "Resilient Flooring": Wall base and termination strips installed with carpet.
 - 4. Division 09 Section "Sheet Carpeting": Broadloom carpet applications.
 - 5. Division 09 Section "Resilient Textile Sheet Flooring": Antimicrobial textile sheet flooring.
 - 6. Division 10 Section "Access Flooring": Access flooring to receive carpet tile. / Carpet tile specified to be provided with access flooring.
 - 7. Division 12 Section "Floor Mats and Frames": Carpet type entrance mats.

1.2 SUBMITTALS

- A. Product Data: For each type of product indicated. Include manufacturer's written data on physical characteristics, durability, and fade resistance. Include installation methods.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Transition details to other flooring materials.
- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.
 - 1. Carpet Tile: Full-size Sample.
 - 2. Exposed Edge Stripping and Accessory: 12-inch-long Samples.
- D. Product Schedule: Use same room and product designations indicated on Drawings and in schedules.
- E. Maintenance Data: For carpet tile to include in maintenance manuals specified in Division 01. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the Floor Covering Installation Board or who can demonstrate compliance with its certification program requirements.
- B. Fire-Test-Response Characteristics: Provide products with the critical radiant flux classification indicated in Part 2, as determined by testing identical products per ASTM E 648 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Mockups: Before installing carpet tile, install mockups for each type of carpet tile installation required to demonstrate aesthetic effects and qualities of materials and execution. Install mockups to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Install mockups in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of dates and times when mockups will be installed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before starting work.
 - 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.

1.4 PRODUCT HANDLING

- A. General: Comply with CRI 104, Section 4.0, "Storage and Handling" for delivery, storage and handling of carpet tile.

1.5 PROJECT CONDITIONS

- A. General: Comply with CRI 104, Section 7.1, "Site Conditions; Ambient Temperature and Humidity Suitable Substrates."
- B. Environmental Limitations: Do not install carpet tile until wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- C. Do not install carpet 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.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tile, install carpet tile before installing these items.

1.6 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Carpet Tile 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, edge raveling, snags, runs, and delamination.

1. Warranty Period: 10 years from date of Substantial Completion.

1.7 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd.

PART 2 - PRODUCTS

2.1 CARPET TILE

- A. Carpet Products: Subject to compliance with requirements, provide products indicated in Finish Legend on the Drawings.
 1. Drawing Type Designation: [CPTL-#][MAT-#].
 2. For substitutions proposed by Contractor, submit detailed product data for scheduled products and proposed substitutions for comparison.
- B. Performance Characteristics: As follows:
 1. Critical Radiant Flux Classification: Not less than 0.45 W/sq. cm.
 2. Dry Breaking Strength: Not less than 100 lbf per ASTM D 2646.
 3. Colorfastness to Crocking: Not less than 4, wet and dry, per AATCC-165.
 4. Colorfastness to Light: Not less than 4 after 40 AFU (AATCC fading units) per AATCC-16.
 5. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria; not less than 1-mm halo of inhibition for gram-negative bacteria; no fungal growth; per AATCC-174.

2.2 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided by or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and that is recommended by carpet tile manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Verify that substrates and conditions are satisfactory for carpet tile installation and comply with requirements specified.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
 2. Subfloor finishes comply with requirements specified in Division 3 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. For wood subfloors, verify the following:
1. Underlayment over subfloor complies with requirements specified in Division 6 Section "Rough Carpentry."
 2. Underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 7.1, "Site Conditions; Substrate Conditions," Section 8.0, "Substrate Preparation," and carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 10.0, "Carpet Tile."
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. 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.
- D. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- E. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- F. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
 - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
 - 2. Remove yarns that protrude from carpet tile surface.
 - 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 11.0, "Post Installation."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 72 00 - WALL COVERINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Vinyl wall covering. (VWC-1)
 2. Custom digital image vinyl wall covering. (DWC-1)
 3. Custom digital window film. (DWF-1)
 4. Tackable wall surfacing material. (TWS-1)
 5. Tackable wall surfacing material applied over continuous cork sheet material, for direct application to wall surface.
- B. Related Sections include the following:
1. Division 09 Section "Painting and Coating": Priming wall surfaces.
 2. Division 10 Section "Visual Display Surfaces": Individual tackboards.
 3. Division 10 Section "Protective Wall Covering": Impact-resistant sheet and panel wall coverings.

1.2 SUBMITTALS

- A. Product Data: Include data on physical characteristics, durability, fade resistance, flame-resistance characteristics, and mold, mildew and bacterial resistance.
- B. Shop Drawings: Show location and extent of each wall covering/window film type. Indicate seams and termination points.
- C. Samples for Initial Selection: Manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available.
- D. Samples for Verification: Sets for each color, texture, and pattern specified, showing the full range of variations expected in these characteristics.
1. Wall Covering Material: Full-width sample, not less than 36 inches long, from dye lot used for the Work.
 - a. Submit sample with specified treatments applied.
 - b. Mark top and face of material.
 - c. Show complete pattern repeat.
 2. Custom Wall Covering/Window Film Material: (1) Full-scale sample portion of final image, minimum 12" x 12", showing 100 percent resolution on specified substrate and (1) small scale version of full graphic on specified substrate.
- E. Maintenance Data: To include in the operation and maintenance manual specified in Division 01.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced installer who has completed 5 projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

- B. Fire-Test-Response Characteristics: Provide wall coverings 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.
 - 1. Flame Spread: 25 or less.
 - 2. Smoke Developed: 450 or less.
- C. Mockups: Prior to installing wall covering or window film, construct mockups 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 mockups to comply with the following requirements, using materials indicated for final unit of Work.
 - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect 7 days in advance of the dates and times when mockups will be constructed.
 - 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 4. Obtain Architect's approval of mockups before start of final unit of Work.
 - 5. Retain and maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 6. Approved mockups in an undisturbed condition at the time of Substantial Completion may become part of the completed Work.

1.4 PROJECT CONDITIONS

- A. Space Enclosure and Environmental Limitations: Do not install wall covering until space is enclosed and weatherproof, wet-work in space is completed and nominally dry, work above ceilings is complete, and ambient temperature and humidity conditions are and will be continuously maintained at values near those indicated for final occupancy.
- B. Lighting: Do not install wall covering until a lighting level of not less than 15 foot-candles is provided on the surfaces to receive wall covering.
- C. Ventilation: Provide continuous ventilation during installation and for not less than the time recommended by the wall covering manufacturer for full drying or curing.

1.5 EXTRA MATERIALS

- A. Furnish extra materials described below, before installation begins, that match products installed, are packaged with protective covering for storage, and are identified with labels describing contents.
 - 1. Rolls of Wall Covering Material: Full-size units equal to 5 percent of amount of each type installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Wall Covering Products: Subject to compliance with requirements, provide products scheduled on the Drawings.
 - 1. For substitutions proposed by Contractor, submit detailed product data for scheduled products and proposed substitutions for comparison.

2.2 VINYL WALL COVERING

- A. All materials shall be mercury and cadmium free. Material shall have antimicrobial inhibitors throughout the vinyl substrate and shall conform to CFFA-W-101-D, CCC-408-D, C, B, A by using the test methods as outlined by FedSpec CCC-T-191B, except as otherwise specified.
1. Total Weight: 13 oz per sq. yard/20 oz per lineal yard
 2. Vinyl weight 17 oz.
 3. Fabric weight 3 oz.
 4. Fabric backing cotton, cotton/polyester blend, polyester nonwoven.
 5. Breaking strength: Exceed type II minimum breaking strength 50 lbs machine direction-warp. Exceeding Type II minimum 55 lbs. cross machine direction fill.
 6. Fire Testing: ASTM-E84 Tunnel Test; Class A
 - a. NFPA 286 Corner Burn Test; Class A
 - b. NFPA 265 Corner Burn Test; Class A
 - c. BS476 Part 6 & 7.
 7. Mold/Mildew/Bacterial Resistance:
 - a. ASTM-G21 Specifications: Pass all requirements of CCCw-408-D

2.3 DIGITAL IMAGE VINYL WALLCOVERING

- A. Material Composition: Digital image shall be printed on no less than 52 inch/54 inch vinyl wall covering substrate using UV piezo drop on demand technology or Ecosol with environmentally friendly ink systems. Printing produced in CMYK or RGB. Images shall be dried and fully cured prior to shipping. Product – As indicated on Drawings or comparable product by one of the following.
1. Momentum; Eykon
 2. Color Reflections
 - ~~4.3.~~ Takeform; Amplify
- B. Provide 6 (six) hours of art coordination with the digital wall covering manufacturer.

2.4 DIGITAL WINDOW FILM

- A. Material Composition: Digital image shall be printed on 54 inch super clear window film using UV piezo drop on demand technology or Ecosol with environmentally friendly ink systems. Printing produced in CMYK or RGB. Images shall be dried and fully cured prior to shipping. Product – As indicated on Drawings or comparable product by one of the following.
1. Takeform
 2. Surface Materials – Level One
 - ~~4.3.~~ Color Reflections
- B. Provide 2 (two) hours of art coordination with the digital wall covering manufacturer.

2.5 TACKABLE WALL SURFACE ASSEMBLIES

- A. Natural Cork Sheet: Seamless, single layer, compressed fine-grain cork sheet, bulletin board quality; face sanded for natural finish.
1. Thickness: 1/4 inch.
- B. Tackable Facing Material: Fabric from same dye lot; color and pattern as follows:
1. Product: As indicated on Drawings.
 2. Colors: As indicated on Drawings, or if not indicated, as selected by Architect from manufacturer's full range.

2.6 ACCESSORIES

- A. Adhesives (For Wall Covering): Mildew-resistant, nonstaining adhesive, for use with specific wall covering and substrate application, as recommended by wall covering manufacturer.
- B. Wall Liner: Nonwoven, synthetic underlayment and adhesive as recommended by wall covering manufacturer.
- C. Wall Liner for Masonry Walls: For application of vinyl wall coverings over masonry walls, provide rolled plaster wall covering substrate complying with the following:
 - 1. Basis-of-Design Product: Faster Plaster Heavy Duty Wall Liner No. 609; Flexi-Wall Systems, Div. of Wall & Floor Treatments Inc., Liberty SC, (1-800-843-5394).
 - 2. Adhesive Product: Flexi-Wall No. 500 Adhesive.
 - 3. Thickness: 50 mils.
 - 4. Weight: 42 oz./sq. yd.
 - 5. Roll Width: 48 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates for compliance with requirements for moisture content and other conditions affecting performance of Work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions for surface preparation.
- B. Clean substrates of substances that could impair wall covering's bond, including mold, mildew, oil, grease, incompatible primers, and dirt.
- C. Prepare substrates to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, and defects.
 - 1. Painted Surfaces: Treat areas susceptible to pigment bleeding.
 - 2. Moisture Content: Maximum of 5 percent on new plaster, concrete, and concrete masonry units when tested with an electronic moisture meter.
 - 3. Prime new gypsum board with primer recommended by wall covering manufacturer.
- D. Check painted surfaces for pigment bleeding. Sand gloss, semigloss, and eggshell finishes with fine sandpaper.
- E. Install wall liner, with no gaps or overlaps, where required by wall covering manufacturer. Form smooth wrinkle-free surface for finished installation. Do not begin wall covering installation until wall liner has dried.
 - 1. For application of vinyl wall coverings over masonry walls, apply rolled plaster wall covering according to manufacturer's instructions and the following:
 - a. Do not align seams with vertical mortar joints in masonry substrate.
 - b. After installation of rolled plaster wall covering, treat mortar joints that have telegraphed through by wiping with joint compound using a broad knife on top of the wall liner.
 - c. Allow to dry thoroughly, not less than 24 hours.
 - d. Prime with latex primer and allow to dry before application of vinyl wall covering.

- F. Acclimatize wall covering materials by removing them from packaging in the installation areas not less than 24 hours before installation.

3.3 INSTALLATION, GENERAL

- A. General: Comply with wall coverings manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Cut wall covering panels in roll number sequence. Change run numbers at partition breaks and corners only.
- C. Install wall covering with no gaps or overlaps.
- D. For patterns that require matching, follow manufacturer's recommendations ~~match pattern 72 inches above finish floor.~~ Match pattern of digital image in all locations.
- E. Install seams vertical and plumb at least 6 inches from outside corners and 3 inches from inside corners. No horizontal seams.
- F. Remove air bubbles, wrinkles, blisters, and other defects.
- G. Trim edges for color uniformity, pattern match, and tight closure at seams and edges. Butt seams.
- H. Install ~~tackable wall surface~~ material over wall surfaces with continuous trowel-applied adhesive, with seams vertical and evenly spaced for wall width ~~horizontal and level, with lowest seam 24 inches above finished floor.~~
 - 1. Double cut seams, with no gaps or overlaps. Remove air bubbles, wrinkles, blisters, and other defects.
 - 2. ~~Sand joints between cork sheets before applying tackable facing material.~~
 - 3. After installation, remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.

3.4 INSTALLATION, WINDOW FILM

- A. General: Comply with window film manufacturers' written installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Clean surface with 4 teaspoons of "joy" detergent to one gallon of luke-warm water. Wash and dry the window with paper or lint free towel.
- C. Use rubbing alcohol as the final cleanse and dry with paper or lint free towel. Do not allow alcohol to dry by air.
- D. Super clear window film requires a wet application install.
- E. Use lint free paper towel to wipe over the edges of the graphic to be certain that all water has been removed.

3.5 CLEANING

- A. Remove excess adhesive at finished seams, perimeter edges, and adjacent surfaces.
- B. Use cleaning methods recommended by ~~wall covering~~ manufacturer.

C. Replace strips that cannot be cleaned.

END OF SECTION 09 72 00

SECTION 09 84 36 - SOUND ABSORBING CEILING UNITS

PART 1 - GENERAL

1.1. SECTION INCLUDES

- A. Single Plus Baffles

1.2. REFERENCES

- A. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- B. ASTM E 84/CAN/ULC S102 Standard Test Method for Surface Burning Characteristics of Building Materials.
- C. NFPA 701 (2010; Small Scale Test) Standard Methods of Fire Tests for Flame Resistant Textiles and Films.
- D. NFPA 705 Recommended Practice for a Field Flame Test for Textiles and Films.
- E. SIN 722-06 Flammability Requirements for Fire Retardant Trees and Plants.
- F. Title 19 California State Fire Marshal minimum requirements for flame resistance products identified in Section 13115, California Health and Safety Code.
- G. NF X 70-100 (1986, Tube Furnace Method) Fire Test for Analysis of Pyrolysis and Combustion Gasses. Evaluation of Toxic Fumes.

1.3. SUBMITTALS

- A. Product Data: Submit Data sheet or Manufacturer Documentation for each product showing dimensions, materials, and colors.
- B. Shop Drawings: Submit shop drawings of site plans showing details of construction, product configuration, and related construction.
- C. Verification Samples: Submit samples of each chosen material and color.

1.4. QUALITY ASSURANCE

- A. Single-Source Responsibility: Provide acoustical components and installation components by a single manufacturer.
- B. Coordination of Work: Coordinate acoustical component work with installers of related work including, but not limited to light fixtures, mechanical systems, electrical systems, and sprinklers.

1.5. DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical components to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
- B. Before installing, allow acoustic components to gradually reach room temperature and a stabilized moisture content.
- C. Handle acoustic components carefully to avoid damage.

1.6. PROJECT CONDITIONS

- A. Space Enclosure:
 - 1. Acoustical Components: All wet work must be complete and dry prior to installation. Installation shall be carried out where the temperature is between 60 degrees F and 100 degrees F. These temperature conditions must be maintained for optimal component lifespan.

1.7. WARRANTY

- A. Acoustic Room Component: Submit a written manufacturer warranty, agreeing to repair or replace acoustical components that fail within the warranty period. Failures include, but are not limited to:
 - 1. Acoustical Room Component: Manufacturer's defects
- B. Warranty Period:
 - 1. Acoustical Room Component: Refer to manufacturer's standard warranty.

PART 2 - PRODUCTS

2.1. MANUFACTURER

- A. Accepted Manufacturer: CSI Creative.
 - 1. Location: 9901 W 74th St, Eden Prairie, MN 55344
 - 2. Phone: 800-213-0653
 - 3. Email: info@csicreative.com
 - 4. Web Address: www.csicreative.com
- B. Substitutions: Or equal substitutions are allowable per substitution specifications.

2.2. SOUND ABSORBING BAFFLES

A. Basis-of-Design:

1. [Product Name] by CSI Creative www.csicreative.com
2. Materials
 - a. Acoustic Substrate: Soundcore® 100 percent recyclable 12mm PET, 60 percent recycled content.
 - a. ASTM E 84/CAN/ULC S102: Pass
 - b. NFPA 701: Pass
 - c. NFPA 705: Pass
 - d. SIN 722-06: Pass
 - e. California Title 19: Pass
 - f. NF X 70-100: Pass
 - b. Contains no formaldehyde, chemical irritants, or harmful substances.
 - c. VOC info: VOC Free, Berkeley Analytical Certificate ID 190313-01
3. Panel Thickness: [See finish schedule]
4. Panel Size: [See finish schedule]
5. Felt Color: [See finish schedule]
6. Acoustic Substrate Color: [N/A]
7. Edge: [Exposed Edge] [Covered Edge].
8. Attachment Method: [Individual Suspension] and [Rail Suspension].
9. Properties:
 - a. Acoustic Performance: NRC (ASTM C423): 0.45 - 1.55 varies by design.
 - b. Burning Characteristics: ASTM E-84 Class A

PART 3 - EXECUTION

BAFFLE CEILINGS

3.1. EXAMINATION

- A. Proceed with installation only when all wet work is completed, and unsatisfactory site conditions have been corrected.

3.2. INSTALLATION

- A. Clean substrates and attachment points of dirt, oils, and other substances that could cause issues during installation.
- B. Install units in accordance with manufacturer's instructions and approved submittals.

3.3. ADJUSTING AND CLEANING

- A. Replace damaged or broken components.
- B. Adjust units for proper position, uniform appearance and operation.
- C. Clean exposed and semi-exposed surfaces using materials acceptable to the manufacturer.
- D. Maintenance of components should consist of:
 - i. Blot spills from material quickly. Wipe with a damp cloth. If stain persists, apply small quantities of carpet or upholstery shampoo solution with a damp cloth (test on inconspicuous location first). Blot well with a clean cloth after each application. Avoid excessive amounts of water. Ensure adequate ventilation if the product is subject to excessive moisture.

3.4. WASTE MANAGEMENT

- A. Waste Management
 - i. Coordinate recycling of waste materials with Section [01 74 19 - Construction Waste Management and Disposal].
 - ii. Collect recyclable waste and dispose of or recycle field generated construction waste created during demolition, construction or final cleaning.
 - iii. Remove recycling containers and bins from site.

3.5. PROTECTION

- A. Protect finished installation from dust and damage from subsequent and ongoing construction activity.

END OF SECTION

SECTION 09 90 00 - INTERIOR, EXTERIOR AND HIGH PERFORMANCE PAINTS AND COATINGS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Interior paint and coating commercial systems including surface preparation.
- B. Exterior paint and coating systems including surface preparation.

1.2 RELATED SECTIONS

- A. Section 03 30 00 - Cast-in-Place Concrete.
- B. Section 05 12 16 - Fabricated Fireproofed Steel Columns.
- C. Section 05 50 00 - Metal Fabrications.
- D. Section 08 11 13.16 - Custom Hollow Metal Doors and Frames.
- E. Section 09 21 16.23 - Gypsum Board Shaft Wall Assemblies.

1.3 REFERENCES

- A. Steel Structures Painting Council (SSPC):
 - 1. SSPC-SP 1 - Solvent Cleaning.
 - 2. SSPC-SP 2 - Hand Tool Cleaning.
 - 3. SSPC-SP 3 - Power Tool Cleaning.
 - 4. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.
- B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 - Administrative Requirements.
- B. Product Data: For each paint system indicated, including.
 - 1. Product characteristics.
 - 2. Surface preparation instructions and recommendations.
 - 3. Primer requirements and finish specification.
 - 4. Storage and handling requirements and recommendations.
 - 5. Application methods.
 - 6. Cautions for storage, handling and installation.
- C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors, and sheens available.
- D. Verification Samples: For each finished product specified, submit samples that represent the actual product, color, and sheen.
- E. Coating Maintenance Manual: Upon conclusion of project, the Contractor or paint manufacturer/supplier shall furnish a coating maintenance manual, such as Sherwin-

Williams, "Custodian Project Color and Product Information" report or equal. Manual shall include an Area Summary with finish schedule, Area Detail designating where each product/color/finish was used, product data pages, Material Safety Data Sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.
- B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors, and sheens available.
- C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.
- D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
 - 1. Finish surfaces for verification of products, colors, and sheens.
 - 2. Finish area designated by Architect.
 - 3. Provide samples that designate primer and finish coats.
 - 4. Compatibility and Adhesion: Check after one week of drying and curing by testing in accordance with ASTM D3359; Adhesion by tape test. If the coating system is incompatible, additional surface preparation up to and including complete removal may be required.
 - 5. Do not proceed with remaining work until the Architect approves the mock-up.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
 - 1. Product name, and type (description).
 - 2. Application and use instructions.
 - 3. Surface preparation.
 - 4. VOC content.
 - 5. Environmental handling.
 - 6. Batch date.
 - 7. Color number.
- B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.
- C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.
- D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

1.7 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 EXTRA MATERIALS

- A. Furnish extra paint materials from the same production run as the materials applied and, in the quantities, described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.
- B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Sherwin-Williams, which is located at:
Local Office: 711 First Ave. King of Prussia, PA 19406
Local Rep: Rica Suhanec, Email: Rica.Suahanec@sherwin.com, Phone: 215-806-3579
- B. Requests for substitutions will be considered in accordance with the provisions of Section 01 60 00 - Product Requirements.

2.2 APPLICATIONS/SCOPE

- A. Interior Paint and Coating Commercial Systems:
 - 1. Concrete: Poured, precast, tilt-up, cast-in-place, cement board, plaster.
 - 2. Metal: Aluminum, galvanized steel.
 - 3. Metal: Structural steel, joists, trusses, beams, partitions, and similar items.
 - 4. Drywall: Drywall board, Gypsum board.
- B. Exterior Paint and Coating Systems:
 - 1. Concrete: Cementitious siding, flexboard, transite, and shingles; non-roof.
 - 2. Metal: Miscellaneous iron, ornamental iron, ferrous metal.

2.3 PAINT MATERIALS - GENERAL

- A. Paints and Coatings:
 - 1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
 - 2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufacturer's product instructions for optimal color conformance.
- B. Primers: Where the manufacturer offers options on primers for a particular substrate, use a primer categorized as "best" by the manufacturer.
- C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.
- D. Color: Refer to Finish Schedule for paint colors, and as selected.

2.4 INTERIOR PAINT AND COATING COMMERCIAL SYSTEMS

- A. Concrete:
 - 1. Latex Systems: Low Traffic Areas
 - a. Eg-Shel / Satin Finish:
 - 1) 1st Coat: S-W Loxon Concrete and Masonry Primer Sealer, LX02W50 (8 mils. wet, 3.2 mils. dry per coat).

- 2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
 - 3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils. wet, 1.7 mils. dry per coat).
 2. Epoxy Systems; Waterbased: High Traffic and Wet Areas
 - a. Eg-Shel/Low Luster Finish:
 - 1) 1st Coat: S-W Loxon Concrete and Masonry Primer Sealer, LX02W50 (8 mils. wet, 3.2 mils. dry per coat).
 - 2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
 - 3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils. wet, 1.5 mils. dry per coat).
- B. Metal; Galvanized: Ceilings and Duct work.
 1. Dryfall Waterborne Topcoats:
 - a. Flat Finish:
 - 1) 1st Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series.
 - 2) 2nd Coat: S-W Pro Industrial Waterborne Acrylic Dryfall, B42-181 Series (6.0 mils. wet, 1.7 mils. dry per coat).
- C. Metal: Trim
 1. Alkyd Systems; Waterbased:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils. wet, 2.0 mils. dry per coat).
 - 2) 2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
 - 3) 3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils. wet, 1.4 - 1.7 mils. dry per coat).
- D. Drywall: Walls, Ceilings, Gypsum Board, and similar items.
 1. Latex Systems: Low Traffic Areas
 - a. Eg-Shel / Satin Finish:
 - 1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils. wet, 1.5 mils. dry per coat).
 - 2) 2nd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series.
 - 3) 3rd Coat: S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-2600 Series (4 mils. wet, 1.7 mils. dry per coat).
 2. Epoxy Systems; Waterbased: High Traffic and Wet Areas
 - a. Eg-Shel/Low Luster Finish:
 - 1) 1st Coat: S-W ProMar 200 Zero VOC Interior Latex Primer, B28W2600 (4 mils. wet, 1.5 mils. dry per coat).
 - 2) 2nd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series.
 - 3) 3rd Coat: S-W Pro Industrial Pre-Catalyzed Waterbased Epoxy, K45-Series (4 mils. wet, 1.5 mils. dry per coat).

2.5 EXTERIOR PAINT AND COATING SYSTEMS

- A. Concrete:
 1. Latex Systems:
 - a. Flat Finish:
 - 1) 1st Coat: S-W Loxon XP Waterproofing Masonry Coating, LX11-50 Series.
 - 1) 2nd Coat: S-W Loxon XP Waterproofing Masonry Coating, LX11-50 Series (14.5-18.5 mils. wet, 6.5-8.4 mils. dry per coat).

- B. Metal: Miscellaneous.
 - 1. Alkyd Systems; Waterbased:
 - a. Semi-Gloss Finish:
 - 1) 1st Coat: S-W Pro Industrial Pro-Cryl Universal Primer, B66-1310 Series (5.0 mils. wet, 2.0 mils. dry per coat).
 - 2) 2nd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series.
 - 3) 3rd Coat: S-W Pro Industrial Waterbased Alkyd Urethane Enamel Semi-Gloss, B53-1150 Series (4.0-5.0 mils. wet, 1.4 - 1.7 mils. dry per coat).

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until the substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.
- C. Previously Painted Surfaces: Verify that existing painted surfaces do not contain lead based paints, notify Architect immediately if lead based paints are encountered.

3.2 SURFACE PREPARATION

- A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint, or other contamination to ensure good adhesion.
 - 1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
 - 2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow the surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
 - 3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
 - 4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface, and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.
- B. Aluminum: Remove all oil, grease, dirt, oxide, and other foreign material by cleaning per SSPC-SP1, Solvent Cleaning.
- C. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface

should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

- D. Cement Composition Siding/Panels: Remove all surface contamination by washing with an appropriate cleaner, rinse thoroughly and allow to dry. Existing peeled or checked paint should be scraped and sanded to a sound surface. Pressure clean, if needed, with a minimum of 2100 psi pressure to remove all dirt, dust, grease, oil, loose particles, laitance, foreign material, and peeling or defective coatings. Allow the surface to dry thoroughly. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments.
- E. Drywall - Interior: Must be clean and dry. All nail heads must be set and spackled. Joints must be taped and covered with a joint compound. Spackled nail heads and tape joints must be sanded smooth, and all dust removed prior to painting.
- F. Galvanized Metal: Clean per SSPC-SP1 using detergent and water or a degreasing cleaner to remove greases and oils. Apply to a test area, priming as required. Allow the coating to dry at least one week before testing. If adhesion is poor, Brush Blast per SSPC-SP16 is necessary to remove these treatments.
- G. Steel: Structural, Plate, And Similar Items: Should be cleaned by one or more of the surface preparations described below. These methods are used throughout the world for describing methods for cleaning structural steel. Visual standards are available through the Society of Protective Coatings. A brief description of these standards together with numbers by which they can be specified follow.
 - 1. Solvent Cleaning, SSPC-SP1: Solvent cleaning is a method for removing all visible oil, grease, soil, drawing and cutting compounds, and other soluble contaminants. Solvent cleaning does not remove rust or mill scale. Change rags and cleaning solution frequently so that deposits of oil and grease are not spread over additional areas in the cleaning process. Be sure to allow adequate ventilation.
 - 2. Hand Tool Cleaning, SSPC-SP2: Hand Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Beforehand tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
 - 3. Power Tool Cleaning, SSPC-SP3: Power Tool Cleaning removes all loose mill scale, loose rust, and other detrimental foreign matter. It is not intended that adherent mill scale, rust, and paint be removed by this process. Before power tool cleaning, remove visible oil, grease, soluble welding residues, and salts by the methods outlined in SSPC-SP1.
- H. Stucco: Must be clean and free of any loose stucco. If recommended procedures for applying stucco are followed, and normal drying conditions prevail, the surface may be painted in 30 days. The pH of the surface should be between 6 and 9 unless the products are designed to be used in high pH environments such as Loxon.

3.3 INSTALLATION

- A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.
- B. Do not apply it to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30 days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

- C. Apply coatings using methods recommended by manufacturer.
- D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.
- E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.
- F. Regardless of the number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.
- G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

3.4 PROTECTION

- A. Protect finished coatings from damage until completion of project.
- B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

SECTION 09 96 46 - INTUMESCENT PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Intumescent paint for [interior][and][exterior] items and surfaces.

B. Related Requirements:

1. Section 078123 "Intumescent Fire Protection" for fire-resistance-rated intumescent mastic materials.
2. Section 099113 "Exterior Painting" for primers and finish coats that may be used with intumescent paint finishes.
3. Section 099123 "Interior Painting" for primers and finish coats that may be used with intumescent paint finishes.
4. Section 099300 "Staining and Transparent Finishing" for primers, finish coats, and wood stains that may be used with intumescent paint finishes.
5. Section 099633 "High-Temperature-Resistant Coatings" for special coatings designed for use on steel subject to extremely high temperatures.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Indicate VOC content.

B. Sustainable Design Submittals:

1. Third-Party Certifications: For each product.
2. Third-Party Certified Life Cycle Assessment: For each product.

C. Samples: For each type of topcoat product.

D. Samples for Initial Selection: For each type of topcoat product.

E. Samples for Verification: For each type of coating system and each color and gloss of intumescent paint finish indicated.

1. Submit Samples on [rigid backing][actual substrate], not less than 8 inches square.

2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

- F. Product Schedule: Use same designations indicated on Drawings and in Part 3 intumescent painting schedules to cross-reference paint systems specified in this Section. Include color designations.

1.4 INFORMATIONAL SUBMITTALS

- A. Material Test Reports: For each intumescent paint.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match materials applied and that are packaged with protective covering for storage and identified with labels describing contents.
1. Quantity: Furnish an additional [5]<Insert number> percent of each color applied, but not less than [1 gal.]<Insert value> of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated 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 coating system.
 - a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
 - b. Other Items: Architect will designate items or areas required.
 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply waterborne intumescent paints only when temperatures of surfaces to be painted and ambient air temperatures are between 50 and 90 deg F.
- B. Apply solvent-thinned intumescent paints only when temperatures of surfaces to be painted and ambient air temperatures are between 45 and 95 deg F.
- C. Do not apply intumescent paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.
- D. Allow wet surfaces to dry thoroughly and to attain temperature and conditions specified before starting or continuing coating operation.

PART 2 - PRODUCTS

2.1 INTUMESCENT PAINT PRODUCTS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 1. [Albi Protective Coatings]
 2. [Contego International, Inc.]
 3. [FireFree Coatings, Inc.]
 4. [Flame Control Coatings, LLC]
 5. [Flame Seal, LLC]
 6. [FlameOff Coatings, Inc.]
 7. [Insl-X Products; Benjamin Moore & Co.]
 8. [International Fireproof Technology Inc]
 9. [No-Burn, Inc.]
 10. [NoFire Technologies, Inc.]
 11. [Quantum Chemical High Performance Coatings; Quantum Technical Services Ltd.]
 12. [Sherwin-Williams Company (The)]
 13. [The Pittsburgh Paints Company]
 14. [TPR2 Corporation]
 15. <Insert manufacturer's name>
- B. Comply with requirements for fire-retardant coating classification and surface-burning characteristics indicated.
- C. Surface-Burning Characteristics of Fire-Retardant Systems: As tested according to

ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: [25][75]<Insert value> or less.
2. Smoke-Developed Index: [450]<Insert value> or less.

D. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each material or coat, provide products recommended in writing by intumescent paint manufacturer for use on substrate indicated.

E. VOC Content, LEED 2009: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: VOC not more than 200 g/L.
4. Clear Wood Finishes, Varnishes: VOC not more than 350 g/L.

F. Low-Emitting Materials, LEED 2009: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

G. VOC Content, LEED v4: For field applications[that are inside the weatherproofing system], paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 50 g/L.
3. Primers, Sealers, and Undercoaters: 100 g/L.
4. Clear Wood Finishes, Varnishes: 275 g/L.

H. Low-Emitting Materials, LEED v4: For field applications that are inside the weatherproofing system, paints and coatings shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

I. Material Emissions and Pollutant Control: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:

1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." Formaldehyde emissions shall not exceed 9 mcg/cu. m or 7 ppb, whichever is less.

2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoaters: 100 g/L.
- J. Emissions Requirements: Field-applied paints and coatings that are inside the weatherproofing system shall comply with either of the following:
 1. Low-Emitting Materials: VOC emissions shall comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
 2. VOC content shall not exceed limits of authorities having jurisdiction and the following:
 - a. Flat Coatings: 50 g/L.
 - b. Nonflat Coatings: 100 g/L.
 - c. Primers, Sealers, and Undercoats: 100 g/L.
 - d. Clear Wood Finishes (Varnishes, Sanding Sealers, and Lacquers): 275 g/L.
- K. VOC Content: For field applications inside the building, wall paints shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
 1. Interior Flat Latex Wall Paint: 50 g/L.
 2. Interior Nonflat Latex Wall Paint: 150 g/L.
- L. VOC Emissions: For field applications inside the building, wall paints shall contain no more than half of the chronic REL of VOCs when tested according to the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers." The building concentration of formaldehyde shall not exceed half of the indoor recommended exposure limit or 33 mcg/cu. m and that of acetaldehyde shall not exceed 9 mcg/cu. m.
- M. Colors and Gloss: [As selected by Architect from manufacturer's full range][Match Architect's samples][As indicated in a color schedule]<Insert requirements>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with manufacturer's requirements for surface treatments, shop-primed surfaces, maximum moisture content, and other conditions affecting performance of the Work.
- B. Begin coating only when moisture content of wood substrate is 15 percent or less when

measured with an electronic moisture meter.

- C. Begin coating no sooner than [28]<Insert number> days after substrate is constructed and is visually dry on both sides.
- D. Verify suitability of substrates, including surface conditions, and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.
- B. Remove hardware and hardware accessories, plates, machined surfaces, light 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, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants. Do not coat surfaces if surface moisture content or alkalinity exceeds that permitted in manufacturer's written instructions.
 - 1. Remove incompatible primers, and reprime substrate with compatible primers as required to produce coating systems indicated.
 - 2. Perform cleaning and coating application so dust and other contaminants from cleaning process do not fall on wet, newly coated surfaces.

3.3 INSTALLATION

- A. Apply intumescent paints according to manufacturer's written instructions and to comply with requirements for listing and labeling for surface-burning characteristics specified.
 - 1. Use equipment and techniques best suited for substrate and type of material being applied.
 - 2. Coat surfaces behind movable items the same as similar exposed surfaces.
 - 3. Apply each coat separately according to manufacturer's written instructions.
 - 4. Finish doors on faces with intumescent finish. Paint tops, bottoms, and side edges with fire-inert finish.
- B. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.

- C. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Produce sharp lines and color breaks.
 - 1. Pigmented Finishes: If undercoats or other conditions show through pigmented topcoat/overcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
 - 2. Clear Finishes: Produce a smooth surface film of even sheen[using multiple coats].

3.4 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.5 EXTERIOR INTUMESCENT PAINTING SCHEDULE

- A. Wood Substrates, Glued-Laminated Construction:
 - 1. Pigmented, Fire-Retardant System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant topcoat, exterior, low sheen.
 - 1) <Insert manufacturer's name; product name or designation>.
 - 2. Clear, Fire-Retardant, Penetrating Wood Preservative System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-resistant sealer, for exterior wood.
 - 1) <Insert manufacturer's name; product name or designation>.
- B. Wood Substrates, Exposed Framing:
 - 1. Pigmented, Fire-Retardant System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, exterior, low sheen.

1) <Insert manufacturer's name; product name or designation>.

2. Clear, Fire-Retardant, Penetrating Wood Preservative System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-resistant sealer, for exterior wood.

1) <Insert manufacturer's name; product name or designation>.

C. Wood Substrates, [Wood Trim][Architectural Woodwork][and][Wood Board Siding]:

1. Pigmented, Fire-Retardant System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, exterior, low sheen.

1) <Insert manufacturer's name; product name or designation>.

2. Clear, Fire-Retardant, Penetrating Wood Preservative System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-resistant sealer, for exterior wood.

1) <Insert manufacturer's name; product name or designation>.

D. Wood Substrates, Wood-Based Panel Products:

1. Pigmented, Fire-Retardant System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, exterior, low sheen.

1) <Insert manufacturer's name; product name or designation>.

2. Clear, Fire-Retardant, Penetrating Wood Preservative System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-resistant sealer, for exterior wood.

1) <Insert manufacturer's name; product name or designation>.

3.6 INTERIOR INTUMESCENT PAINTING SCHEDULE

A. Wood Substrates, Glued-Laminated Construction:

1. Pigmented, Fire-Retardant, Water-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat:

1) Fire-retardant coating, latex, interior, flat.

- a) <Insert manufacturer's name; product name or designation>.

2) Fire-retardant topcoat, latex, interior.

- a) <Insert manufacturer's name; product name or designation>.

2. Pigmented, Fire-Retardant, Solvent-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant coating, alkyd, interior, flat.

1) <Insert manufacturer's name; product name or designation>.

3. Clear, Fire-Retardant, Water-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant coating, interior, clear.

1) <Insert manufacturer's name; product name or designation>.

4. Clear, Fire-Retardant, Solvent-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, clear, alkyd, interior.

1) <Insert manufacturer's name; product name or designation>.

B. Wood Substrates, Exposed Framing:

1. Pigmented, Fire-Retardant, Water-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat:

1) Fire-retardant coating, latex, interior, flat.

- a) <Insert manufacturer's name; product name or designation>.
- 2) Fire-retardant topcoat, latex, interior.
 - a) <Insert manufacturer's name; product name or designation>.
- 2. Pigmented, Fire-Retardant, Solvent-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, alkyd, interior, flat.
 - 1) <Insert manufacturer's name; product name or designation>.
- 3. Clear, Fire-Retardant, Water-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, interior, clear.
 - 1) <Insert manufacturer's name; product name or designation>.
- 4. Clear, Fire-Retardant, Solvent-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant topcoat, clear, alkyd, interior.
 - 1) <Insert manufacturer's name; product name or designation>.
- C. Wood Substrates, [Wood Trim][Architectural Woodwork][and][Wood Board Paneling]:
 - 1. Pigmented, Fire-Retardant, Water-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat:
 - 1) Fire-retardant coating, latex, interior, flat.
 - a) <Insert manufacturer's name; product name or designation>.
 - 2) Fire-retardant topcoat, latex, interior.
 - a) <Insert manufacturer's name; product name or designation>.
 - 2. Pigmented, Fire-Retardant, Solvent-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, alkyd, interior, flat.

- 1) <Insert manufacturer's name; product name or designation>.
3. Clear, Fire-Retardant, Water-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, interior, clear.
 - 1) <Insert manufacturer's name; product name or designation>.
4. Clear, Fire-Retardant, Solvent-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant topcoat, clear, alkyd, interior.
 - 1) <Insert manufacturer's name; product name or designation>.
- D. Wood Substrates, Wood-Based Panel Products:
 1. Pigmented, Fire-Retardant, Water-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat:
 - 1) Fire-retardant coating, latex, interior, flat.
 - a) <Insert manufacturer's name; product name or designation>.
 - 2) Fire-retardant topcoat, latex, interior.
 - a) <Insert manufacturer's name; product name or designation>.
 2. Pigmented, Fire-Retardant, Solvent-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, alkyd, interior, flat.
 - 1) <Insert manufacturer's name; product name or designation>.
 3. Clear, Fire-Retardant, Water-Based System:
 - a. Prime Coat: As recommended in writing by topcoat manufacturer.
 - b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
 - c. Topcoat: Fire-retardant coating, interior, clear.
 - 1) <Insert manufacturer's name; product name or designation>.
 4. Clear, Fire-Retardant, Solvent-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, clear, alkyd, interior.

1) <Insert manufacturer's name; product name or designation>.

E. Wood Substrates, Wood Shingles and Shakes:

1. Pigmented, Fire-Retardant, Water-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat:

1) Fire-retardant coating, latex, interior, flat.

a) <Insert manufacturer's name; product name or designation>.

2) Fire-retardant topcoat, latex, interior.

a) <Insert manufacturer's name; product name or designation>.

2. Pigmented, Fire-Retardant, Solvent-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant coating, alkyd, interior, flat.

1) <Insert manufacturer's name; product name or designation>.

3. Clear, Fire-Retardant, Water-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant coating, interior, clear.

1) <Insert manufacturer's name; product name or designation>.

4. Clear, Fire-Retardant, Solvent-Based System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.
- c. Topcoat: Fire-retardant topcoat, clear, alkyd, interior.

1) <Insert manufacturer's name; product name or designation>.

F. Plaster and Gypsum Board Substrates:

1. Fire-Retardant Coating (Clear or Pigmented) System:

- a. Prime Coat: As recommended in writing by topcoat manufacturer.
- b. Intermediate Coat: As recommended in writing by topcoat manufacturer.

c. Topcoat:

1) Fire-retardant coating, interior, clear.

a) <Insert manufacturer's name; product name or designation>.

2) Fire-retardant coating, alkyd, interior, flat.

a) <Insert manufacturer's name; product name or designation>.

2. Water-Based, Fire-Retardant Coating System:

a. Prime Coat: As recommended in writing by topcoat manufacturer.

b. Intermediate Coat: As recommended in writing by topcoat manufacturer.

c. Topcoat:

1) Fire-retardant coating, latex, interior, flat.

a) <Insert manufacturer's name; product name or designation>.

2) Fire-retardant topcoat, latex, interior.

a) <Insert manufacturer's name; product name or designation>.

END OF SECTION 09 96 46

SECTION 10 12 00 - DISPLAY CASES & SIGNAGE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Illuminated display cases.
 - 2. Digital Display Screen and Cabinet
- B. Related Sections:
 - 1. Division 09 Section "Fixed, Sound Absorptive Panels" for tackable, fabric-covered wall panels.
 - 2. Division 16 Sections for wiring and other electrical work associated with illuminated display cases.

1.3 DEFINITIONS

- A. Bulletin Board: Tackable visual display surface or tackboard enclosed in a display case.
- B. Display Case: Glazed cabinet with visual display surface background and adjustable shelves.

1.4 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Display cases shall withstand the effects of earthquake motions according to ASCE/SEI 7.
 - 1. Component Importance Factor is 1.0.

1.5 SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.
- B. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Show location of seams and joints in visual display surfaces.
 - 2. Include sections of typical trim members.
 - 3. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: For units with factory-applied color finishes, and as follows:
 - 1. Actual sections of visual display surfaces.
 - 2. Section of header panel for color selection.
- D. Samples for Verification: For each type of product indicated.

1. Visual Display Surface: Not less than 8-1/2 by 11 inches (215 by 280 mm), mounted on substrate indicated for final Work. Include one panel for each type, color, and texture required.
 2. Trim: 6-inch- (152-mm-) long sections of each trim profile including corner section.
- E. Delegated-Design Submittal: For display cases 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. Qualification Data: For qualified professional engineer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.
- H. Maintenance Data: For visual display surfaces, operating hardware, and illuminated units to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain display cases from single source 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.
- 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. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aluminum
- B. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering, and 6 mm thick unless otherwise indicated.

- C. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.2 DISPLAY CASES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Claridge Products and Equipment, Inc.
 - 2. Marsh Industries.
 - 3. Poblocky Sign Company.
 - 4. Tablet & Ticket Co. (The).
- B. Recessed Cabinet: Factory-fabricated cabinet; with tackboard assembly on back inside surface, operable glazed doors at front, and trim on face to cover edge of recessed opening.
 - 1. Cabinet Box: Hardwood veneer plywood.
 - 2. Cabinet Frame and Trim: Maple with transparent finish.
 - 3. Veneer Species: Maple with transparent finish.
 - 4. Cabinet Box: Hardwood-veneer-plywood top and bottom panels with transparent finish; glazed side panels.
- C. Adjustable Shelf Standards and Supports: BHMA A156.9, B04102; with shelf brackets, B04112; recess mounted in rear surface. Provide standards full height of display case.
- D. Tack Surface: Polyester-Fabric-Faced Tackboard: 1/4-inch- (6-mm-) thick, polyester-fabric-faced cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard backing.
 - 1. Color: Match Architect's sample.
- E. Illumination System: Concealed top-lighting system consisting of LED-strip fixtures. Include lamps and internal wiring with single concealed electrical connection to building system. Coordinate electrical characteristics with power supply provided.
 - 1. Ballasts: Low-temperature, high-power-factor, low-energy, fluorescent lamp ballasts that comply with Certified Ballast Manufacturers Association standards and carry its label.
- F. Width: As indicated on Drawings.
- G. Height: As indicated on Drawings.
- H. Depth: As indicated on Drawings.

2.3 DIGITAL DISPLAY

- A. Standard Features provided by Digital Display Manufacturer:
- B. **Life of sign = *Minimum*** of 10 years guarantee of parts availability and support direct from the digital sign manufacturer.
- C. Communication to Sign:
 - o 4G Wireless communication with life of sign data included.
 - o Preferred wireless network: Verizon
 - o Modem to have 5-year parts warranty.

- **Control Software:**
 - Software to be hosted on the manufacturer's servers at no cost to the customer.
 - Software to be 100% cloud-based software, including a cloud-based editor for creating content, multiple content zones, and playlists
 - Able to integrate widgets and RSS Feeds.
 - Include a content library of more than 1000 pieces of graphics and animations
 - Allows for smart scheduling, which eliminates competing products to display in the same daypart.
 - Import and store JPG, GIF, PNG, and TGA image files; MP4 video files with HD 1080 capability; MP3, WAV and WMA audio files.
- **Warranty:**
 - 5 Year Parts warranty. Warranty to include all components of the sign.
 - Provide a ten-year (10) year parts availability guarantee.
 - Replacement parts to be shipped the same day when requested by 3 p.m. CST.
 - Provide toll-free service coordination.
- **Manufacturer Support to be included in bid for a minimum of 10 years from date of purchase:**
 - Remote diagnostics from the manufacturer's U.S. technical support team.
 - Web-based training and support of software
 - Automatic software updates, including content library of artwork.
 - Unlimited log-ins for software, along with the ability to customize level of access for each user.

STANDARD FEATURES**Brightness** Daytime 7500 NITs Maximum; Nighttime 700 NITs Maximum.**Color** LED RGB**Color Capability** Min. 1.2 Quintillion**Includes** Ignite Graphics Software**Video** Up to 30FPS**Viewing Angles** 150 Horizontal/95 Vertical**Software Training** Web Based Software Training**Communications** 4G Wireless with Verizon Cellular**Wireless Data Plan** Life-of-sign Data Plan**Warranty** Standard 5-Year Parts**Base Bid:** 8mm**PRODUCT SPECIFICATIONS****Pixel Pitch:** W8mm LED RGB**Pixel Matrix:** 180H X 396W**Ventilation Style:** Front Ventilation – Active ventilation only**Cabinet Size:** 5ft 5in H x 11ft 3in L x 8in D**Viewing Area:** 5ft H x 11ft L**Cabinet Style:** Single Face**Character Size:** 18 lines / 79.2 Characters at a 3" type**Warranty:** Standard 5 Year Watchfire warranty applies.**Electrical Service:** 240 VOLT 4 WIRE 24amps

2.4 FABRICATION

- A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
- B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil-canning, and to impart strength for size, design, and application indicated.
- C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.
- D. Fabricate exterior units with vents to permit evaporation of moisture trapped inside.
- E. Fabricate shelf standards plumb and at heights to align shelf brackets for level shelves.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical power system to verify actual locations of connections before installation of illuminated units.
- C. Examine walls and partitions for proper backing for display cases.
- D. Examine walls and partitions for suitable framing depth if recessed units will be installed.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for display cases as required by type and size of unit.

3.3 INSTALLATION

- A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
 - 1. Mounting Height: As indicated.
- B. Recessed Display Cases: Attach units to wall framing with fasteners at not more than 16 inches (400 mm) o.c. Attach aluminum trim over edges of recessed display cases and conceal grounds and clips. Attach trim with fasteners at not more than 24 inches (600 mm) o.c.
- C. Comply with requirements in Division 26 for connecting illuminated display cases.
 - 1. After installation is complete, install new fluorescent lamps.
- D. Install display case shelving level and straight.

3.4 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
- B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 10 12 00

SECTION 10 14 19 - DIMENSIONAL LETTER SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Dimensional characters.
 - a. Cast dimensional characters.
 - b. Cutout dimensional characters.
 - c. Fabricated channel dimensional characters.
 - d. Illuminated, fabricated channel dimensional characters.
 - e. Molded-plastic dimensional characters.
 - f. Illuminated, molded-plastic dimensional characters.

1.2 ALLOWANCES

- A. Allowances for [signage][dimensional letter signs][illuminated, fabricated channel dimensional characters]<Insert item description> are specified in Section 012100 "Allowances."
- B. <Insert product or material>[is][are] part of <Insert name of allowance>.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Illuminated: Illuminated by lighting source integrally constructed as part of the sign unit.

1.5 COORDINATION

- A. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:

- C. Shop Drawings: For signs.
 - 1. Include fabrication and installation details and attachments to other work.
 - 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 - 3. Show message list, typestyles, graphic elements, and layout for each sign at least [half size]<Insert scale>.
 - 4. Show locations of electrical service connections.
 - 5. Include diagrams for power, signal, and control wiring.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
 - 1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
 - 1. Dimensional Characters: [Full-size Sample][Half-size Sample]<Insert size> of[each type of] dimensional character.
 - 2. Exposed Accessories: [Full-size Sample][Half-size Sample]<Insert size> of each accessory type.
 - 3. Full-size Samples, if approved, will be returned to Contractor for use in the Project.
- F. Product Schedule: For dimensional letter signs. Use same designations indicated on Drawings or specified.
- G. Delegated Design Submittal: For [signs indicated in "Performance Requirements" Article]<Insert sign designations>.
 - 1. Include structural analysis calculations for signs indicated to comply with design loads; signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][and][manufacturer].
- B. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.9 QUALITY ASSURANCE

- A. Installer Qualifications: [Manufacturer of products][An entity that employs installers and

supervisors who are trained and approved by manufacturer].

1.10 FIELD CONDITIONS

- A. Field Measurements: Verify locations of electrical service embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: [Five]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of [rooftop][dimensional character]<Insert description> sign type(s) <Insert drawing designation of sign(s)> according to structural performance requirements.
- B. Structural Performance: Signs and supporting elements shall withstand the effects of gravity and other loads within limits and under conditions indicated.
 - 1. Uniform Wind Load: [As indicated on Drawings]<Insert design load>.
 - 2. Concentrated Horizontal Load: [As indicated on Drawings]<Insert design load>.
 - 3. Other Design Load: [As indicated on Drawings]<Insert design load>
 - 4. Uniform and concentrated loads need not be assumed to act concurrently.
- C. Thermal Movements: For exterior [fabricated channel dimensional characters]<Insert item>, allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: [120 deg F, ambient; 180 deg F, material surfaces]<Insert temperature change>.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 DIMENSIONAL CHARACTERS

- A. Cast Characters: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [ASI Sign Systems, Inc]
 - d. [Cosco]
 - e. [Gemini Signage; Gemini, Inc.]
 - f. [Matthews International Corporation; Bronze Division]
 - g. [Metal Arts]
 - h. [Metallic Arts]
 - i. [Southwell Company (The)]
 - j. <Insert manufacturer's name>
 2. Character Material: Cast [aluminum][brass][bronze][zinc]<Insert material>.
 3. Character Height: [As indicated on Drawings]<Insert dimension>.
 4. Thickness: [As indicated on Drawings][Manufacturer's standard for size of character]<Insert dimension>.
 5. Finishes:
 - a. Integral Metal Finish: [Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
 - c. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
 - d. Overcoat: [Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>.
 6. Mounting: [As indicated on Drawings][Concealed studs][Projecting studs][Rosette-head through fasteners][Countersunk flathead through fasteners]<Insert requirement>.
 7. Typeface: [Times Roman]<Insert requirement>.
- B. Cutout Characters: Characters with uniform faces; square-cut, smooth[, eased] edges; precisely formed lines and profiles; and as follows:
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers

offering products that may be incorporated into the Work include, but are not limited to, the following]:

- a. [A.R.K. Ramos]
 - b. [ACE Sign Systems, Inc.]
 - c. [APCO Graphics, Inc]
 - d. [ASI Sign Systems, Inc]
 - e. [Cosco]
 - f. [Diskey Sign Company]
 - g. [Gemini Signage; Gemini, Inc.]
 - h. [inpro Corporation]
 - i. [Matthews International Corporation; Bronze Division]
 - j. [Metal Arts]
 - k. [Metallic Arts]
 - l. [Southwell Company (The)]
 - m. [Steel Art Company]
 - n. <Insert manufacturer's name>
2. Character Material: Sheet or plate [aluminum][brass][bronze][copper][stainless steel][zinc][acrylic][acrylic with laminated aluminum facing][acrylic with laminated brass facing][acrylic with laminated bronze facing][acrylic with laminated stainless steel facing]<Insert material>.
 3. Character Height: [As indicated on Drawings]<Insert dimension>.
 4. Thickness: [As indicated on Drawings][Manufacturer's standard for size of character][0.125 inch][0.25 inch]<Insert dimension>.
 5. Finishes:
 - a. Integral Metal Finish: [Mill][Antique oxidized][As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
 - b. Integral Aluminum Finish: [Clear anodized][Light bronze anodized][Medium bronze anodized][Match Architect's sample][Anodized color as selected by Architect from full range of industry colors and color densities]<Insert finish>.
 - c. Integral Stainless Steel Finish: [No. 4][No. 8][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert description>.
 - d. Integral Acrylic Color: [As indicated by manufacturer's designation][Match Architect's sample][As selected by Architect from full range of industry colors]<Insert color>.
 - e. Baked-Enamel or Powder-Coat Finish: Manufacturer's standard, in color [as indicated by manufacturer's designation][matching Architect's sample][as selected by Architect from manufacturer's full range]<Insert color>.
 - f. Overcoat: [Manufacturer's standard baked-on clear coating][Clear organic coating]<Insert requirement>.
 - g. Painted Edges: Paint edges of acrylic characters with laminated metal facing as recommended in writing by manufacturer.
 6. Mounting: [As indicated on Drawings][Concealed studs][Projecting studs][Rosette-head through fasteners][Countersunk flathead through

fasteners][Concealed, painted aluminum back bar or bracket assembly][Concealed, stainless steel back bar or bracket assembly][Adhesive]<Insert requirement>.

7. Typeface: [Times Roman]<Insert requirement>.

2.3 DIMENSIONAL CHARACTER MATERIALS

- A. Aluminum Castings: ASTM B26/B26M, alloy and temper recommended by sign manufacturer for casting process used and for type of use and finish indicated.
- B. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- D. Brass Castings: ASTM B584, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C85200 (high-copper yellow brass)]<Insert requirement>.
- E. Brass Sheet (Yellow Brass): ASTM B36/B36M, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C26000 (yellow brass)]<Insert requirement>.
- F. Bronze Castings: ASTM B584, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C86500 (No. 1 manganese bronze)]<Insert requirement>.
- G. Bronze Plate: ASTM B36/B36M, [alloy recommended by manufacturer and finisher for finish indicated][lead-free alloy recommended by manufacturer and finisher for finish indicated][Alloy UNS No. C22000 (commercial bronze)]<Insert requirement>.
- H. Copper Sheet: ASTM B152/B152M.
- I. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, [Type 304,][Type 316,] stretcher-leveled standard of flatness.
- J. Zinc Castings: ASTM B240, alloy and temper recommended by sign manufacturer for type of use and finish indicated.
- K. Zinc Sheet: [ASTM B69]<Insert standard>, alloy and temper recommended by sign manufacturer for type of use and finish indicated.
- L. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- M. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
1. Use concealed fasteners and anchors unless indicated to be exposed.
 2. For exterior exposure, furnish [nonferrous-metal][stainless steel][or][hot-dip galvanized]<Insert requirement> devices unless otherwise indicated.
 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
 - b. Fastener Heads: For nonstructural connections, use [flathead][or][oval countersunk]<Insert shape> screws and bolts with tamper-resistant [Allen-head][spanner-head][or][one-way-head]<Insert slot design> slots unless otherwise indicated.
 4. Sign Mounting Fasteners:
 - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - b. Projecting Studs: Threaded studs with sleeve spacer, welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.
 - c. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, installed in predrilled holes.
- B. Adhesive: As recommended by sign manufacturer.
- C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
 2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.

3. Comply with AWS for recommended practices in welding and brazing. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
 4. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
 5. Internally brace dimensional characters for stability, to meet structural performance loading without oil-canning or other surface deformation, and for securing fasteners.
 6. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
 7. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.
- B. Brackets: Fabricate brackets, fittings, and hardware for bracket-mounted signs to suit sign construction and mounting conditions indicated. Modify manufacturer's standard brackets as required.
1. Aluminum Brackets: Factory finish brackets with baked-enamel or powder-coat finish [to match sign-background color][to match Architect's sample]<Insert requirement> color unless otherwise indicated.
 2. Stainless Steel Brackets: Factory finish brackets [to match sign background][to match Architect's sample][with No. 4]<Insert finish> finish unless otherwise indicated.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- C. Directional Finishes: Run grain with long dimension of each piece and perpendicular to long dimension of finished trim or border surface unless otherwise indicated.
- D. Organic, Anodic, and Chemically Produced Finishes: Apply to formed metal after fabrication but before applying contrasting polished finishes on raised features unless otherwise indicated.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.
- B. Color Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.

- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 STAINLESS STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 2. Directional Satin Finish: No. 4.
 - 3. Dull Satin Finish: No. 6.
 - 4. Reflective, Directional Polish: No. 7.
 - 5. Mirrorlike Reflective, Nondirectional Polish: No. 8.

2.9 LACQUER COATING FOR COPPER-ALLOY FINISHES

- A. Lacquer Coating: Clear, organic, waterborne, air-drying, acrylic lacquer called "Incralac"; specially developed for coating copper-alloy products; consisting of a solution of acrylic resin, methyl methacrylate copolymer, leveling agent, and corrosion inhibitor benzotriazole.

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.
- B. Verify that sign-support surfaces are within tolerances to accommodate signs without gaps or irregularities between backs of signs and support surfaces unless otherwise indicated.
- C. Verify that electrical service is correctly sized and located to accommodate signs.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF DIMENSIONAL CHARACTERS

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.

2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.

B. Mounting Methods:

1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Projecting Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
 - a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place spacers on studs, place sign in position, and push until spacers are pinched between sign and substrate, embedding the stud ends in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place spacers on studs, place sign in position with spacers pinched between sign and substrate, and install washers and nuts on stud ends projecting through opposite side of surface, and tighten.
3. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
4. Back Bar and Brackets: Remove loose debris from substrate surface and install backbar or bracket supports in position, so that signage is correctly located and aligned.
5. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
6. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.

3.3 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed characters and signs that do not comply with specified requirements. Replace characters with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 19

SECTION 10 14 23.16 - ROOM-IDENTIFICATION PANEL SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes room-identification signs that are directly attached to the building.
- B. Related Requirements:
 - 1. Section 101300 "Directories" for building directories.
 - 2. Section 101416 "Plaques" for one-piece, solid metal signs, with or without frames, that are used for high-end room-identification.

1.2 ALLOWANCES

- A. Allowances for [signage][room-identification signs]<Insert item description> are specified in Section 012100 "Allowances."
- B. <Insert product or material>[is][are] part of <Insert name of allowance>.

1.3 UNIT PRICES

- A. Work of this Section is affected by unit prices specified in Section 012200 "Unit Prices."

1.4 DEFINITIONS

- A. Accessible: In accordance with the accessibility standard.

1.5 COORDINATION

- A. Furnish templates for placement of sign-anchorage devices embedded in permanent construction by other installers.
- B. Furnish templates for placement of electrical service embedded in permanent construction by other installers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Sustainable Design Submittals:
- C. Shop Drawings: For room-identification signs.

1. Include fabrication and installation details and attachments to other work.
 2. Show sign mounting heights, locations of supplementary supports to be provided by other installers, and accessories.
 3. Show message list, typestyles, graphic elements[, including raised characters and Braille], and layout for each sign at least [half size]<Insert scale>.
- D. Samples for Initial Selection: For each type of sign assembly, exposed component, and exposed finish.
1. Include representative Samples of available typestyles and graphic symbols.
- E. Samples for Verification: For each type of sign assembly showing all components and with the required finish(es), in manufacturer's standard size unless otherwise indicated and as follows:
1. Room-Identification Signs: [Full-size Sample]<Insert size>.
 2. Variable Component Materials: [Full-size Sample][8-inch Sample]<Insert size> of each base material, character (letter, number, and graphic element) in each exposed color and finish not included in Samples above.
 3. Exposed Accessories: [Full-size Sample][Half-size Sample]<Insert size> of each accessory type.
 4. Full-size Samples, if approved, will be returned to Contractor for use in Project.
- F. Product Schedule: For room-identification signs. Use same designations indicated on Drawings or specified.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For [Installer][and][manufacturer].
- B. Sample Warranty: For special warranty.

1.8 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For signs to include in maintenance manuals.

1.9 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials[, from the same product run,] that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Variable Component Materials: [12]<Insert number> replaceable text inserts and interchangeable characters (letters, numbers, and graphic elements) of each type.
 2. Tools: [One]<Insert number> set(s) of specialty tools for assembling signs and replacing variable sign components.

1.10 QUALITY ASSURANCE

- A. Installer Qualifications: [Manufacturer of products][An entity that employs installers and supervisors who are trained and approved by manufacturer].

1.11 FIELD CONDITIONS

- A. Field Measurements: Verify locations of [anchorage devices][and][electrical service] embedded in permanent construction by other installers by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of finishes beyond normal weathering.
 - b. Deterioration of embedded graphic image.
 - c. Separation or delamination of sheet materials and components.
 - 2. Warranty Period: [Five]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Accessibility Standard: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [the ABA standards of the Federal agency having jurisdiction] [and] [ICC A117.1] <Insert requirement>.

2.2 ROOM-IDENTIFICATION SIGNS

- A. Room-Identification Sign: [Sign][Sign system] with smooth, uniform surfaces; with message and characters having uniform faces, sharp corners, and precisely formed lines and profiles; and as follows:
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [ACE Sign Systems, Inc.]
 - b. [Advance Corporation]
 - c. [Allen Industries]

- d. [APCO Graphics, Inc]
 - e. [ASE, Inc]
 - f. [ASI Sign Systems, Inc]
 - g. [Best Sign Systems, Inc.]
 - h. [Clarke Systems]
 - i. [Cosco]
 - j. [Diskey Sign Company]
 - k. [Foresight Supersign]
 - l. [inpro Corporation]
 - m. [Mohawk Sign Systems]
 - n. [Nelson-Harkins Industries]
 - o. [Poblocki Sign Company, LLC]
 - p. [Seton Identification Products; a Brady Corporation company]
 - q. [Signature Signs, Inc.]
 - r. [Signs & Decal Corp]
 - s. [Vista System, LLC]
 - t. [Vomar Products, Inc]
 - u. <Insert manufacturer's name>
2. Laminated-Sheet Sign: [Photopolymer][Sandblasted polymer]<Insert material> face sheet with raised graphics laminated[over subsurface graphics] to [acrylic][phenolic]<Insert material> backing sheet to produce composite sheet.
- a. Composite-Sheet Thickness: [As indicated on Drawings][Manufacturer's standard for size of sign][0.125 inch][0.25 inch]<Insert dimension>.
 - b. Surface-Applied Graphics: Applied [vinyl film][paint][photo image]<Insert requirement>.
 - c. Subsurface Graphics: [Reverse halftone or dot-screen image][Reverse etch image][Snap-in changeable insert beneath removable face sheet][Slide-in changeable insert]<Insert requirement>.
 - d. Color(s): [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
3. Sign-Panel Perimeter: Finish edges smooth.
- a. Edge Condition[at Vertical Edges][at Horizontal Edges]: [As indicated on Drawings][Square cut][Beveled][Bullnosed]<Insert requirement>.
 - b. Corner Condition in Elevation: [As indicated on Drawings][Square][Rounded to radius indicated]<Insert requirement>.
4. Frame: [Entire perimeter][Horizontal retainers][Vertical retainers][to hold changeable sign panel]<Insert description>.
- a. Material: [Aluminum]<Insert material>.
 - b. Material Thickness: <Insert dimension>.
 - c. Frame Depth: [As indicated on Drawings][Convex-curved frame to receive removable face sheet and changeable subsurface graphics]<Insert dimension>.
 - d. Profile: [Square][Beveled][Rounded]<Insert requirement>.
 - e. Corner Condition in Elevation: [Square][Mitered][Rounded to radius indicated]<Insert requirement>.

- f. Finish and Color: [Mill][Clear anodized][Light bronze anodized][Medium bronze anodized][Painted, matte black color][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert requirement>.
- 5. Mounting: [Manufacturer's standard method for substrates indicated][Surface mounted to wall] with [concealed anchors][countersunk flathead through fasteners][adhesive][two-face tape][hook-and-loop tape][or][magnetic tape].
- 6. Text and Typeface: [Accessible raised characters and Braille][Times Roman][typeface as indicated by manufacturer's designation][typeface matching Architect's sample][typeface as selected by Architect from manufacturer's full range][and][variable content as scheduled]<Insert requirement>.[Finish raised characters to contrast with background color, and finish Braille to match background color.]

2.3 SIGN MATERIALS

- A. Aluminum Sheet and Plate: ASTM B209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- B. Aluminum Extrusions: ASTM B221, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated.
- C. Acrylic Sheet: ASTM D4802, category as standard with manufacturer for each sign, Type UVF (UV filtering).
- D. Vinyl Film: UV-resistant vinyl film with pressure-sensitive, permanent adhesive; die cut to form characters or images as indicated on Drawings[and suitable for exterior applications].
- E. Paints and Coatings for Sheet Materials: Inks, dyes, and paints that are recommended by manufacturer for optimum adherence to surface and are UV and water resistant for colors and exposure indicated.

2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signs, noncorrosive and compatible with each material joined, and complying with the following:
 - 1. Use concealed fasteners and anchors unless indicated to be exposed.
 - 2. For exterior exposure, furnish [nonferrous-metal][stainless-steel][or][hot-dip galvanized]<Insert requirement> devices unless otherwise indicated.
 - 3. Exposed Metal-Fastener Components, General:
 - a. Fabricated from same basic metal and finish of fastened sign unless otherwise indicated.
 - b. Fastener Heads: Use [flathead][or][oval countersunk]<Insert shape> screws and bolts with tamper-resistant [Allen-head][spanner-head][or][one-way-head]<Insert slot design> slots unless otherwise indicated.

4. Sign Mounting Fasteners:

- a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material or screwed into back of sign assembly unless otherwise indicated.
- b. Through Fasteners: Exposed metal fasteners matching sign finish, with type of head indicated, and installed in predrilled holes.

B. Adhesive: As recommended by sign manufacturer.

C. Two-Face Tape: Manufacturer's standard high-bond, foam-core tape, 0.045 inch thick, with adhesive on both sides.

D. Hook-and-Loop Tape: Manufacturer's standard two-part tape consisting of hooked part on sign back and looped side on mounting surface.

E. Magnetic Tape: Manufacturer's standard magnetic tape with adhesive on one side.

2.5 FABRICATION

A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.

1. Preassemble signs and assemblies in the shop to greatest extent possible. Disassemble signs and assemblies only as necessary for shipping and handling limitations. Clearly mark units for reassembly and installation; apply markings in locations concealed from view after final assembly.
2. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
4. Provide rabbets, lugs, and tabs necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.

B. Subsurface-Applied Graphics: Apply graphics to back face of clear face-sheet material to produce precisely formed image. Image shall be free of rough edges.

C. Subsurface-Etched Graphics: Reverse etch back face of clear face-sheet material. Fill resulting copy with manufacturer's standard enamel. Apply opaque manufacturer's standard background color coating over enamel-filled copy.

D. Signs with Changeable Message Capability: Fabricate signs to allow insertion of changeable messages as follows:

1. For snap-in changeable inserts beneath removable face sheet, furnish one suction or other device to assist in removing face sheet. Furnish initial changeable insert. [Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>.
2. For slide-in changeable inserts, fabricate slot without burrs or constrictions that

- inhibit function. Furnish initial changeable insert. [Subsequent changeable inserts are by Owner][Furnish two blank inserts for each sign for Owner's use]<Insert requirement>.
3. For frame to hold changeable sign panel, fabricate frame without burrs or constrictions that inhibit function. Furnish initial sign panel. [Subsequent changeable sign panels are by Owner]<Insert requirement>.

2.6 GENERAL FINISH REQUIREMENTS

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.
- B. Color Anodic Finish: AAMA 611, [Class I, 0.018 mm][Class II, 0.010 mm] or thicker.
- C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
 2. Install signs so they do not protrude or obstruct according to the accessibility standard.
 3. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
- B. Accessibility: Install signs in locations on walls [as indicated on Drawings][and][according to the accessibility standard]<Insert requirement>.
- C. Mounting Methods:
 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.

- a. Masonry Substrates: Fill holes with adhesive. Leave recess space in hole for displaced adhesive. Place sign in position and push until flush to surface, embedding studs in holes. Temporarily support sign in position until adhesive fully sets.
 - b. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
2. Through Fasteners: Drill holes in substrate using predrilled holes in sign as template. Countersink holes in sign if required. Place sign in position and flush to surface. Install through fasteners and tighten.
3. Adhesive: Clean bond-breaking materials from substrate surface and remove loose debris. Apply linear beads or spots of adhesive symmetrically to back of sign and of suitable quantity to support weight of sign after cure without slippage. Keep adhesive away from edges to prevent adhesive extrusion as sign is applied and to prevent visibility of cured adhesive at sign edges. Place sign in position, and push to engage adhesive. Temporarily support sign in position until adhesive fully sets.
4. Two-Face Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position, and push to engage tape adhesive.
5. Hook-and-Loop Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply sign component of two-part tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage; push to engage tape adhesive. Keep tape strips [0.250 inch]<Insert dimension> away from edges to prevent visibility at sign edges when sign is initially installed or reinstalled. Apply substrate component of tape to substrate in locations aligning with tape on back of sign; push and rub well to fully engage tape adhesive to substrate.
6. Magnetic Tape: Clean bond-breaking materials from substrate surface and remove loose debris. Apply tape strips symmetrically to back of sign and of suitable quantity to support weight of sign without slippage. Keep strips away from edges to prevent visibility at sign edges. Place sign in position.

3.2 ADJUSTING AND CLEANING

- A. Remove and replace damaged or deformed signs and signs that do not comply with specified requirements. Replace signs with damaged or deteriorated finishes or components that cannot be successfully repaired by finish touchup or similar minor repair procedures.
- B. Remove temporary protective coverings and strippable films as signs are installed.
- C. On completion of installation, clean exposed surfaces of signs according to manufacturer's written instructions, and touch up minor nicks and abrasions in finish. Maintain signs in a clean condition during construction and protect from damage until acceptance by Owner.

END OF SECTION 10 14 23.16

SECTION 10 21 13.14 - STAINLESS STEEL TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Stainless steel toilet compartments.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for supports that attach [ceiling-hung compartments][floor-and-ceiling-anchored compartments][and][post-to-ceiling screens] to overhead structural system.
2. Section 061000 "Rough Carpentry" for [blocking][overhead support ceiling-anchored compartments][and][overhead support of post-to-ceiling screens].
3. Section 092216 "Non-Structural Metal Framing" for blocking.
4. Section 102800 "Toilet, Bath, and Laundry Accessories" for accessories mounted on toilet compartments.

1.2 COORDINATION

- A. Coordinate requirements for [overhead supports,]blocking, reinforcing, and other supports concealed within wall[and ceiling] to ensure that toilet compartments can be supported and installed as indicated.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Stainless steel toilet compartments.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachment details.
2. Show locations of cutouts for compartment-mounted toilet accessories.
3. Show locations of reinforcements for compartment-mounted grab bars and locations of blocking for surface-mounted toilet accessories.
4. Show locations of centerlines of toilet fixtures.
5. Show locations of floor drains.
6. Show[ceiling grid, ceiling-mounted items, and] overhead support or bracing locations.

- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available finishes for each type of toilet compartment.
 - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: Actual sample of finished products for each type of toilet compartment, hardware, and accessory.
- E. Product Schedule: For toilet compartments, prepared by or under the supervision of supplier, detailing location and selected colors for toilet compartment material.
- F. Delegated Design Submittals: For grab bars mounted on toilet compartment panels, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For toilet compartments.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: [One]<Insert number> hinge(s) with associated fasteners.
 - 2. Latch and Keeper: [One]<Insert number> latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: [One]<Insert number> door bumper(s) with associated fasteners.
 - 4. Door Pull: [One]<Insert number> door pull(s) with associated fasteners.
 - 5. Fasteners: [10]<Insert number> fasteners of each size and type.

1.6 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements, and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain stainless steel toilet compartments from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25]<Insert value> percent.
- B. Recycled Content of Aluminum Components: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25][50]<Insert value> percent.
- C. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: [25][75][200] or less.
 - 2. Smoke-Developed Index: 450 or less.
- D. Structural Performance: Where grab bars are mounted on toilet compartments, design panels to comply with the following requirements:
 - 1. Panels are able to withstand a concentrated load on grab bar of at least 250 lbf applied at any direction and at any point, without deformation of panel.
- E. Regulatory Requirements: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"]and[ICC A117.1]<Insert accessibility regulation> for toilet compartments designated as accessible.

2.3 STAINLESS STEEL TOILET COMPARTMENTS

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - 1. [All American Metal Corp]
 - 2. [American Sanitary Partition Corporation]
 - 3. [ASI Accurate Partitions]
 - 4. [ASI Global Partitions]
 - 5. [Bradley Corporation]
 - 6. [Flush Metal Partitions]
 - 7. [General Partitions Mfg. Corp]
 - 8. [Hadrian Inc.; Zurn Industries, LLC]
 - 9. [Metpar Corp]
- B. Toilet-Enclosure Style: [Overhead braced] Ceiling hung] privacy type].
- C. Urinal-Screen Style: [Wall hung flat panel or Wall hung with integral flanges]
- 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.[Provide with no-sightline system consisting of a full-height continuous stop on

latch side of door and full-height continuous filler strip on hinge side of door (unless continuous hinge is used).] 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 for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units of size and material adequate for panel to withstand specified structural performance requirements.
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. Flat-Panel Urinal Screen: Matching panel construction.
2. Integral-Flange, Wall-Hung Urinal Screen: Similar to panel construction, with integral full-height flanges for wall attachment, and maximum 1-1/4 inches thick.
3. Wedge-Shaped, Wall-Hung Urinal Screen: Similar to panels, V-shaped, fabricated for concealed wall attachment, and maximum 6 inches wide at wall and minimum 1 inch wide at protruding end.

F. Facing Sheets and Closures: Stainless steel sheet of nominal thicknesses as follows:

1. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.038 inch.
2. Pilasters, Unbraced at One End: Manufacturer's standard thickness, but not less than 0.050 inch.
3. Panels: [Manufacturer's standard thickness, but not less than 0.031 inch][0.038 inch].
4. Doors: Manufacturer's standard thickness, but not less than 0.031 inch.
5. Entrance Screens: Thickness matching panels.
6. Flat-Panel Urinal Screens: Thickness matching panels.
7. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.031 inch.
8. Wedge-Shaped, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.038 inch.

G. Pilaster Shoes: Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

H. Pilaster Sleeves (Caps): Formed from stainless steel sheet, not less than 0.031-inch nominal thickness and 3 inches high, finished to match hardware.

I. Urinal-Screen Post: Manufacturer's standard post design of [material matching the thickness and construction of pilasters][or][1-3/4-inch- square, aluminum tube with satin finish]<Insert requirement>; with shoe[and sleeve (cap)] matching that on the pilaster.

J. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets; [chrome-plated zamac][stainless steel].
 2. Full-Height (Continuous) Type: Manufacturer's standard design; [stainless steel][aluminum].
- K. Stainless Steel Finish: [Directional Satin Finish: ASTM A480/A480M, No. 4][Manufacturer's standard textured finish]<Insert finish> on exposed faces. Protect exposed surfaces from damage by application of strippable, temporary protective covering before shipment.

2.4 HARDWARE AND ACCESSORIES

- A. Door Hardware and Accessories: Manufacturer's operating hardware and accessories.
1. Hinges:
 - a. Manufacturer's continuous, spring-loaded type, allowing emergency access by lifting door.
 - 1) Material, Continuous, Spring-Loaded Hinge: [Stainless steel][Aluminum][Manufacturer's standard].
 2. Latch and Keeper: Manufacturer's [recessed][recessed, with occupancy indicator][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 toilet enclosures designated as accessible.
 - a. Material: [Chrome-plated zamac][Stainless steel][Manufacturer's standard].
 3. Coat Hook: Manufacturer's combination hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories.
 - a. Material: [Chrome-plated zamac][Stainless steel][Manufacturer's standard].
 4. Door Bumper: Manufacturer's rubber-tipped bumper at outswinging doors.
 - a. Material: Manufacturer's standard.
 5. Door Pull: Manufacturer's unit at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible.
 - a. Material: [Chrome-plated zamac][Stainless steel][Manufacturer's standard].
- B. Door Hardware and Accessories, Heavy Duty: Manufacturer's heavy-duty institutional operating hardware and accessories.
1. Hinges: Manufacturer's minimum 0.062-inch- thick, stainless steel [gravity-actuated, cam-action, self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees][continuous, cam type that swings to a closed or partially open position][continuous, spring-loaded type]<Insert requirement>,

- allowing emergency access by lifting door. Mount with through bolts.
2. Latch and Keeper: Manufacturer's heavy-duty, surface-mounted, cast stainless steel latch unit designed to resist damage due to slamming, with combination rubber-faced door strike and keeper, and with provision for emergency access. Provide units that comply with regulatory requirements for accessibility at toilet enclosures designated as accessible. Mount with through bolts.
 3. Coat Hook: Manufacturer's heavy-duty, combination cast stainless steel hook and rubber-tipped bumper, sized to prevent inswinging door from hitting compartment-mounted accessories. Mount with through bolts.
 4. Door Bumper: Manufacturer's heavy-duty, rubber-tipped, cast stainless steel bumper at outswinging doors. Mount with through bolts.
 5. Door Pull: Manufacturer's heavy-duty, cast stainless steel pull at outswinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at toilet enclosures designated as accessible. Mount with through bolts.
- C. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.
- D. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match 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 anchors compatible with related materials.

2.5 MATERIALS

- A. Aluminum Castings: ASTM B26/B26M.
- B. Aluminum Extrusions: ASTM B221.
- C. Stainless Steel Sheet: ASTM A240/A240M or ASTM A666, Type 304, stretcher-leveled standard of flatness.
- D. Stainless Steel Castings: ASTM A743/A743M.
- E. Zamac: ASTM B86, commercial zinc-alloy die castings.

2.6 FABRICATION

- A. Fabricate toilet compartment components to sizes indicated. Coordinate requirements and provide cutouts for through-partition toilet accessories and solid blocking within panel where required for attachment of toilet accessories.
- B. Overhead-Braced Units: Manufacturer's standard corrosion-resistant supports, leveling mechanism, and anchors at pilasters and walls to suit floor and wall conditions. Provide shoes at pilasters to conceal supports and leveling mechanism.
- C. Floor-Anchored Units: Manufacturer's standard corrosion-resistant anchoring

assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

- D. Ceiling-Hung Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at pilasters for connection to structural support above finished ceiling. Provide assemblies that support pilasters from structure without transmitting load to finished ceiling. Provide sleeves (caps) at tops of pilasters to conceal anchorage.
- E. Floor-and-Ceiling-Anchored Units: Manufacturer's standard corrosion-resistant anchoring assemblies at pilasters and walls, with leveling adjustment nuts at tops and bottoms of pilasters. Provide shoes and sleeves (caps) at pilasters to conceal anchorage.
- F. Urinal-Screen Posts: Manufacturer's standard corrosion-resistant anchoring assemblies at posts and walls, with leveling adjustment nuts at[tops and] bottoms of posts. Provide shoes[and sleeves (caps)] at posts to conceal anchorage.
- G. Door Size and Swings: Unless otherwise indicated, provide 24-inch- wide inswinging doors for standard toilet enclosures and 36-inch- wide outswinging doors with a minimum 32-inch- wide clear opening for toilet enclosures designated as accessible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.
 - 1. Confirm location and adequacy of blocking and supports required for installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 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.
 - 1. Maximum Clearances:
 - a. Pilasters and Panels or Screens: 1/2 inch.
 - b. Panels or Screens and Walls: 1 inch.
 - 2. Stirrup Brackets: Secure panels or screens to walls and to pilasters with no fewer than [two brackets attached][three brackets attached at midpoint and] near top and bottom of panel.

- a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- 3. Full-Height (Continuous) Brackets: Secure panels or screens to walls and to pilasters with full-height brackets.
 - a. Locate bracket fasteners so holes for wall anchors occur in masonry or tile joints.
 - b. Align brackets at pilasters with brackets at walls.
- B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Set pilasters with anchors penetrating not less than 1-3/4 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Secure continuous head rail to each pilaster with no fewer than two fasteners. Hang doors to align tops of doors with tops of panels, and adjust so tops of doors are parallel with overhead brace when doors are in closed position.
- C. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.
- D. Ceiling-Hung Units: Secure pilasters to supporting structure and level, plumb, and tighten. Hang doors and adjust so bottoms of doors are level with bottoms of pilasters when doors are in closed position.
- E. Floor-and-Ceiling-Anchored Units: Secure pilasters to supporting construction and level, plumb, and tighten. Hang doors and adjust so doors are level and aligned with panels when doors are in closed position.
- F. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.3 ADJUSTING

- A. Hardware Adjustment: Adjust and lubricate hardware in accordance with hardware manufacturer's written instructions for proper operation. Set hinges on inswinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on outswinging doors to return doors to fully closed position.

END OF SECTION 10 21 13.14

SECTION 10 28 00 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Public-use shower room accessories.
3. Childcare accessories.

B. Related Requirements:

1. Section 088300 "Mirrors" for frameless mirrors.
2. Section 093013 "Ceramic Tiling" for ceramic toilet and bath accessories.

1.2 COORDINATION

- A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.
- B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.3 ACTION SUBMITTALS

A. Product Data: For each product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

C. Delegated Design Submittals: For [grab bars]

1. Include structural design calculations indicating compliance with specified structural-performance requirements.

1.4 INFORMATIONAL SUBMITTALS

- A. Sample Warranty: For manufacturer's special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For accessories to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED MATERIALS

- A. Owner-Furnished Materials: <Insert products>.

2.2 PERFORMANCE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Structural Performance: Design accessories and fasteners to comply with the following requirements:
 - 1. Grab Bars: Installed units are able to resist 250 lbf concentrated load applied in any direction and at any point.
 - 2. Shower Seats: Installed units are able to resist [250 lbf][360 lbf]<Insert load> concentrated load applied in any direction and at any point.

2.3 PUBLIC-USE WASHROOM ACCESSORIES

- A. Source Limitations: Obtain each type of public-use washroom accessory from single source from single manufacturer.
 - 1. See schedules on drawings.

2.4 MATERIALS

- A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, 0.031-inch- minimum nominal thickness unless otherwise indicated.
- B. Steel Sheet: ASTM A1008/A1008M, Designation CS (cold rolled, commercial steel), 0.036-inch- minimum nominal thickness.
- C. Galvanized-Steel Sheet: ASTM A653/A653M, with G60 hot-dip zinc coating.
- D. Galvanized-Steel Mounting Devices: ASTM A153/A153M, hot-dip galvanized after

fabrication.

- E. Fasteners: Screws, bolts, and other devices of same material as accessory unit, unless otherwise recommended by manufacturer or specified in this Section, and tamper and theft resistant where exposed, and of stainless or galvanized steel where concealed.
- F. Chrome Plating: ASTM B456, Service Condition Number SC 2 (moderate service).
- G. Mirrors: ASTM C1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.5 FABRICATION

- A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.
- B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of [six]<Insert number> keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION OF TOILET, BATH, AND LAUNDRY ACCESSORIES

- A. Install accessories in accordance with 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.
 - 1. Remove temporary labels and protective coatings.
- B. Grab Bars: Install to comply with specified structural-performance requirements.

3.2 ADJUSTING AND CLEANING

- A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.
- B. Clean and polish exposed surfaces in accordance with manufacturer's written instructions.

END OF SECTION 10 28 00

Specification - Section 10 22 26 Operable Partitions

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Manually operated, paired panel operable partitions.
- B. Related Sections include the following:
 - 1. Division 03 Sections for concrete tolerances required.
 - 2. Division 05 Sections for primary structural support, including pre-punching of support members by structural steel supplier per operable partition supplier's template.
 - 3. Division 06 Sections for wood framing and supports, and all blocking at head and jambs as required.
 - 4. Division 09 Sections for wall and ceiling framing at head and jambs.

1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified in writing by the operable partition manufacturer, as qualified to install the manufacturer's partition systems for work similar in material, design, and extent to that indicated for this Project.
- B. Acoustical Performance: Test operable partitions in an independent acoustical laboratory in accordance with ASTM E90 test procedure and classified in accordance with ASTM E413 to attain no less than the STC rating specified. Provide a complete and unedited written test report by the testing laboratory upon request.
- C. Preparation of the opening shall conform to the criteria set forth per ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
- D. The operable wall must be manufactured by a certified ISO-9001-2015 company or an equivalent quality control system.
- E. Indoor Air Quality: Operable partition, movable wall manufacturer's non-wood products must meet the SCS Indoor Advantage™ Gold Certification or equivalent. This approval guarantees conformance to indoor air concentrations meeting Indoor Advantage Gold Indoor Air Quality Certified to SCS-105 v4.2-2023 Conforms to ANSI/BIFMA M7.1 and X7.1 and the CDPH/EHLB Standard Method (CA 01350) v1.2-2017 conducted in an independent third-party air quality testing laboratory.

1.4 REFERENCE STANDARDS

- A. ASTM International
 - 1. ASTM E557 Standard Practice for Architectural Application and Installation of Operable Partitions.
 - 2. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
 - 3. ASTM E84 - Surface Burning Characteristics of Building Materials.
 - 4. ASTM E413 - Classification for Rating Sound Insulation
- B. Health Product Declaration Collaborative
 - 1. Health Product Declaration Open Standard v2.1
- C. International Standards Organization

1. ISO 14021 - Environmental Labels and Declarations - Self-Declared Environmental Claims (Type II Environmental Labeling).
 2. ISO 14025:2011-10, Environmental Labels and Declarations - Type III Environmental Declarations - Principles and Procedures.
 3. ISO 14040:2009-11, Environmental Management - Life Cycle Assessment - Principles and Framework.
 4. ISO 14044:2006-10, Environmental Management - Life Cycle Assessment - Requirements and Guidelines.
 5. ISO 21930 – Sustainability in Buildings and Civil Engineering Works — Core Rules for Environmental Product Declarations of Construction Products and Services.
- D. Other Standards
1. ADA – Americans with Disabilities Act

1.5 SUBMITTALS

- A. Product Data: Material descriptions, construction details, finishes, installation details, and operating instructions for each type of operable partition, component, and accessory specified.
- B. Shop Drawings: Show location and extent of operable partitions. Include plans, elevations, sections, details, attachments to other construction, and accessories. Indicate dimensions, weights, conditions at openings, and at storage areas, and required installation, storage, and operating clearances. Indicate location and installation requirements for hardware and track, including floor tolerances required and direction of travel. Indicate blocking to be provided by others.
- C. Setting Drawings: Show imbedded items and cutouts required in other work, including support beam punching template.
- D. Samples: Color samples demonstrating full range of finishes available by architect. Verification samples will be available in same thickness and material indicated for the work.
- E. Reports: Provide a complete and unedited written sound test report indicating glass thickness and spacing in test specimen matches product as submitted.
- F. Create spaces that are healthy for occupants.
 1. Furnish products and materials with Health Product Declaration (HPD), Manufacturer Inventory, or other material health disclosure documentation. Products without an HPD or other disclosure documentation are not acceptable.
- G. Furnish materials that generate the least amount of pollution.
 1. Furnish products and materials that have third party verified environmental product declarations (EPD's). Consider products and materials that have optimized environmental performance (reduced life cycle impacts). Products without an EPD or other disclosure documentation are not acceptable.
- H. Buy American: Folding door to be manufactured in the United States in compliance with applicable U.S. Federal Trade Commission (FTC) and U.S. Customs Service and Border Protections regulations and be labeled "Made in America".

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Clearly mark packages and panels with numbering systems used on Shop Drawings. Do not use permanent markings on panels.
- B. Protect panels during delivery, storage, and handling to comply with manufacturer's direction and as required to prevent damage.

1.7 WARRANTY

- A. Provide written warranty by manufacturer of operable partitions agreeing to repair or replace any components with manufacturing defects.
- B. Warranty period: Ten (10) years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS, PRODUCTS, AND OPERATIONS

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Modernfold, Inc.
 - 2. Or equal
- B. Panels to be manufactured in the U.S.A.
- C. Products: Subject to compliance with the requirements, provide the following product:
 - 1. OP-01: Acousti-Seal Encore™ – Paired Panel: Manually operated paired panel operable partition.

2.2 OPERATION

- A. OP-01: Acousti-Seal Encore™ – Paired Panel: Series of paired flat panels hinged together in pairs, manually operated, top supported with operable floor seals and automatic top seals.
- B. Final Closure:
 - 1. OP-01: Horizontally expanding panel edge with removable crank

2.3 PANEL CONSTRUCTION

- A. Nominal 4-1/4-inch (108mm) thick panels in manufacturer's standard 51-inch (1295mm) widths. All panel horizontal and vertical framing members fabricated from minimum 16-gage formed steel with overlapped and welded corners for rigidity. Top channel is reinforced to support suspension system components. Frame is designed so that full vertical edges of panels are of formed steel and provide concealed protection of the edges of the panel skin.
- B. Panel skin shall be:
 - 1. OP-01: Roll-formed steel wrapping around panel edge. Panel skins shall be lock formed and welded directly to the frame for unitized construction. Acoustical ratings of panels with this construction minimum:
 - a. 54 STC - 21-gage steel
- C. Hinges for Panels, Pass Doors, and Pocket Doors shall be:
 - 1. OP-01: Full leaf butt hinges, attached directly to the panel frame with welded hinge anchor plates within panel to further support hinge mounting to frame. Lifetime warranty on hinges. Hinges mounted into panel edge or vertical astragal are not acceptable.
- D. Panel Trim: No vertical or horizontal trim required or allowed on edges of panels; minimal groove appearance at panel joints.
- E. Panel Weights:
 - 1. OP-01: 54 STC - 9.5 lbs./square foot

2.4 PANEL FINISH

- A. Panel finish shall be factory applied, Class "A" rated material. Finish shall be:
 - 1. OP-01: Customer's own material (subject to factory approval).
- B. Panel Trim: Exposed panel trim of one consistent color:
 - 1. OP-01: To Be Advised

2.5 SOUND SEALS

- A. Vertical Interlocking Sound Seals between panels: Aluminum astragals, with tongue and groove configuration in each panel edge. Rigid plastic astragals are not acceptable.
- B. Horizontal Top Seals shall be Modernfold SureSet™ automatic operable top seals, manually operated top seals not required or permitted.
- C. Horizontal bottom floor seals shall be Modernfold Sureset™ bottom seal:
 - 1. OP-01: SM2 - Manually activated seals providing nominal 2-inch (51 mm) operating clearance with an operating range of +1/2-inch (13 mm) to -1-1/2-inch (38 mm). Seal shall be operable from panel edge or face. Extended seal shall exert nominal 120 pounds (54 kg) downward force to the floor throughout operating range.

2.6 SUSPENSION SYSTEM

- A. OP-01: #17 Suspension System
 - 1. Suspension Tracks: Minimum 11-gauge, 0.12-inch (3.04mm) roll-formed steel track, suitable for either direct mounting to a wood header or supported by adjustable steel hanger brackets, supporting the load-bearing surface of the track, connected to structural support by pairs of 0.38-inch (10mm) diameter threaded rods. Aluminum track is not acceptable.
 - a. Exposed track soffit: Steel, integral to track, and pre-painted off-white.
 - 2. Carriers: One all-steel trolley with steel tired ball bearing wheels per panel (except hinged panels). Non-steel tires are not acceptable.
 - 3. Warranty period: Ten (10) years.

2.7 INTEGRAL DOOR

- A. Single Pass Doors:
 - 1. OP-01: Matching pass door same thickness and appearance as the panels. ADA compliant pass door equipped with friction latch and flush pulls for panic operation. No threshold will be permitted.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. General: Comply with ASTM E557, operable partition manufacturer's written installation instructions, Drawings and approved Shop Drawings.
- B. Install operable partitions and accessories after other finishing operations, including painting have been completed.
- C. Match operable partitions by installing panels from marked packages in numbered sequence indicated on Shop Drawings.
- D. Broken, cracked, chipped, deformed or unmatched panels are not acceptable.

3.2 CLEANING AND PROTECTION

- A. Clean partition surfaces upon completing installation of operable partitions to remove dust, dirt, adhesives, and other foreign materials according to manufacturer's written instructions.
- B. Provide final protection and maintain conditions in a manner acceptable to the manufacturer and Installer that ensure operable partitions are without damage or deterioration at time of Substantial Completion.

3.3 ADJUSTING

- A. Adjust operable partitions to operate smoothly, easily, and quietly, free from binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and other moving parts.

3.4 EXAMINATION

- A. Examine flooring, structural support, and opening, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of operable partitions. Proceed with installation only after unsatisfactory conditions have been corrected.

3.5 DEMONSTRATION

- A. Demonstrate proper operation and maintenance procedures to Owner's representative.
- B. Provide Operation and Maintenance Manual to Owner's representative.

SECTION 10 44 13 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:
 - a. Portable fire extinguisher.
 - b. Portable fire extinguisher and fire-hose valve.
 - c. Portable fire extinguisher, fire hose, rack, and fire-hose valve.
 - d. Fire-hose valve.
 - e. Fire hose, rack, and fire-hose valve.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.
2. Section 211000 "Water-Based Fire-Suppression Systems" for fire-hose connections.

1.2 ALLOWANCES

- A. Fire-protection cabinets are part of <Insert name of allowance>.

1.3 UNIT PRICES

- A. Work of this Section is affected by <Insert name of unit price>.

1.4 PREINSTALLATION CONFERENCE

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.
 1. Review methods and procedures related to fire-protection cabinets, including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 1. Show door hardware, cabinet type, trim style, and panel style. Include roughing-

- in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.
 - 2. Show location of knockouts for hose valves.
 - B. Shop Drawings: For fire-protection cabinets.
 - 1. Include plans, elevations, sections, details, and attachments to other work.
 - C. Samples: For each type of exposed finish required.
 - D. Samples for Initial Selection: For each type of exposed finish required.
 - E. Samples for Verification: For each type of exposed finish required, prepared on samples 6 by 6 inches square.
 - F. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.[Use same designations indicated on Drawings.]
- 1.6 CLOSEOUT SUBMITTALS
- A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.
- 1.7 COORDINATION
- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of [fire extinguishers][fire hoses, hose valves, and hose racks] indicated are accommodated.
 - B. Coordinate sizes and locations of fire-protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain fire-protection cabinets, accessories, and fire extinguishers from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E814 for fire-resistance rating of walls where they are installed.
- 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.

2.3 FIRE-PROTECTION CABINET

- A. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
1. [Babcock-Davis]
 2. [Croker; a Division of Morris Group International]
 3. [Guardian Fire Equipment, Inc]
 4. [JL Industries; Activar Construction Products Group, Inc.]
 5. [Larsen's Manufacturing Company]
 6. [Modern Metal Products]
 7. [MOON American, Inc.]
 8. [Nystrom, Inc.]
 9. [Potter Roemer LLC; a Division of Morris Group International]
 10. [Strike First Corporation of America]
 11. <Insert manufacturer's name>
- B. Fire-Protection Cabinet Type: Suitable for fire [extinguisher][extinguisher and hose valve][hose, rack, valve, and extinguisher][hose, rack, and valve][hose valve].
- C. Cabinet Construction: [Nonrated][One-hour fire rated][Two-hour fire rated].
1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch- thick cold-rolled steel sheet lined with minimum 5/8-inch- thick fire-barrier material. Provide factory-drilled mounting holes.
- D. Cabinet Material: [Cold-rolled steel sheet][Aluminum sheet][Stainless steel sheet].
1. Shelf: Same metal and finish as cabinet.
- E. Recessed Cabinet:
1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box, to act as [plaster stop][drywall bead].
 2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.
 3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
- F. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface, with exposed trim face and wall return at outer edge (backbend).
1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
 2. Rolled-Edge Trim: [2-1/2-inch][4-inch][4-1/2-inch]<Insert dimension> backbend depth.

- G. Surface-Mounted Cabinet: Cabinet box fully exposed and mounted directly on wall with no trim.
- H. Cabinet Trim Material: [Steel sheet][Aluminum sheet][Extruded-aluminum shapes][Stainless steel sheet][Copper-alloy brass sheet][Copper-alloy bronze sheet][Same material and finish as door].
- I. Door Material: [Steel sheet][Aluminum sheet][Extruded-aluminum shapes][Stainless steel sheet][Copper-alloy brass sheet][Copper-alloy bronze sheet].
- J. Door Style: [Fully glazed, frameless, backless, acrylic panel][Fully glazed panel with frame][Full acrylic bubble, frameless][Full acrylic bubble with frame][Full acrylic bubble with frameless, rotating turntable][Horizontal duo panel with frame][Vertical duo panel with frame][Center glass panel with frame][Solid opaque panel with frame][Flush opaque panel, frameless, with no exposed hinges].
- K. Door Glazing: [Clear float glass][Tempered float glass (clear)][Tempered float glass (bronze tint)][Break glass][Tempered break glass][Wire glass][Acrylic sheet][Break acrylic bubble][Molded acrylic bubble].
 - 1. Acrylic Sheet Color:
 - a. [Clear][Bronze] transparent acrylic sheet.
 - b. Clear transparent acrylic sheet painted [white][red][black] on unexposed side.
 - 2. Acrylic Bubble Color: [Clear][Bronze][Red], transparent.
- L. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide [projecting lever handle with cam-action latch][projecting door pull and friction latch][recessed door pull and friction latch][manufacturer's standard].
 - 2. Provide [continuous hinge, of same material and finish as trim,][concealed hinge,][pivot hinge,][manufacturer's standard hinge,] permitting door to open 180 degrees.
- M. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
 - 3. Break-Glass Door Handle: Manufacturer's standard, integral to glass with the words "PULL TO BREAK GLASS" applied to handle.
 - 4. Lettered Door Handle: One-piece, cast-iron door handle with the word "FIRE" embossed into face.
 - 5. Door Lock: [Cam lock that allows door to be opened during emergency by pulling sharply on door handle][Cylinder lock, keyed alike to other cabinets].
 - 6. Identification: Lettering complying with authorities having jurisdiction for letter

style, size, spacing, and location. Locate [as indicated][as directed by Architect]<Insert location>.

- a. Identify fire extinguisher in fire-protection cabinet with the words "[FIRE EXTINGUISHER]<Insert identification>."
 - 1) Location: Applied to [cabinet door][cabinet glazing][location indicated on Drawings].
 - 2) Application Process: [Silk-screened][Engraved][Etched][Decals][Pressure-sensitive vinyl letters].
 - 3) Lettering Color: [Red][Black][White].
 - 4) Orientation: [Vertical][Horizontal][As indicated on Drawings].
7. Alarm: Manufacturer's standard alarm that actuates when fire-protection cabinet door is opened and that is powered by [batteries][low voltage, complete with transformer].

N. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.
 - a. Finish: [Factory primed for field painting][Baked enamel, TGIC polyester powder coat, HAA polyester powder coat, epoxy powder coat, or polyester/epoxy hybrid powder coat, complying with AAMA 2603].
 - b. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - c. Color: [Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.
2. Aluminum: ASTM B221 for extruded shapes and aluminum sheet, with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet.
 - a. Finish: [Clear anodic][Color anodic][Baked enamel or powder coat].
 - b. Color: [Light bronze][Medium bronze][Dark bronze][Match Architect's sample][As selected by Architect from full range of industry colors and color densities]<Insert color>.
3. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304.
 - a. Finish: [ASTM A480/A480M No. 4 directional satin finish,][ASTM A480/A480M No. 8 mirrorlike reflective, nondirectional polish]<Insert finish>.
4. Copper Alloy, Brass: ASTM B36/B36M alloy [as standard with manufacturer]<Insert requirements>.
 - a. Finish: [Polished][Satin][As selected by Architect from full range of industry finishes]<Insert finish>.
5. Copper Alloy, Bronze: ASTM B36/B36M alloy [as standard with

manufacturer]<Insert requirements>.

- a. Finish: [Mirror polish][Satin polish][Satin oxidized oil rub][Clear baked enamel][Match Architect's sample][As selected by Architect from full range of industry finishes]<Insert finish>.
6. Clear Float Glass: ASTM C1036, Type I, Class 1, Quality q3, [3][6] mm thick.
7. Tempered Float Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, [Class 1 (clear)][Class 2 (tinted, heat absorbing, and light reducing), bronze tint].
8. Break Glass: Clear annealed float glass, ASTM C1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.
9. Tempered Break Glass: ASTM C1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.
10. Wire Glass: ASTM C1036, Type II, Class 1, Form 1, Quality q8, Mesh m1 (diamond), 6 mm thick.
11. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), [1.5][3][6] mm thick, with [Finish 1 (smooth or polished)][Finish 2 (patterned, textured)].

2.4 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 1. Weld joints and grind smooth.
 2. Miter corners and grind smooth.
 3. Provide factory-drilled mounting holes.
 4. Prepare doors and frames to receive locks.
 5. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.
 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch thick.
 2. Fabricate door frames of one-piece construction with edges flanged.
 3. Miter and weld perimeter door frames and grind smooth.
- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.5 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

- C. Finish fire-protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining 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 roughing-in for hose [valves][racks] and cabinets to verify actual locations of piping connections before cabinet installation.
- B. Examine walls and partitions for suitable framing depth and blocking where [recessed][and][semirecessed] cabinets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for [recessed][and][semirecessed] fire-protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION OF FIRE-PROTECTION CABINETS

- A. General: Install fire-protection cabinets in locations and at mounting heights indicated[or, if not indicated, at height indicated below:][or, if not indicated, at heights acceptable to authorities having jurisdiction.]
 - 1. Fire-Protection Cabinet Mounting Height: [42 inches]<Insert dimension> above finished floor to top of fire extinguisher.
- B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
 - 1. Unless otherwise indicated, provide recessed fire-protection cabinets. If wall thickness is inadequate for recessed cabinets, provide semirecessed fire-protection cabinets.
 - 2. Provide inside latch and lock for break-glass panels.
 - 3. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
 - 4. Fire-Rated Cabinets:
 - a. Install cabinet with not more than 1/16-inch tolerance between pipe OD and knockout OD. Center pipe within knockout.
 - b. Seal through penetrations with firestopping sealant as specified in Section 078413 "Penetration Firestopping."
- C. Identification:

1. Apply [decals][vinyl lettering] at locations indicated.
2. Apply [decals][vinyl lettering] on field-painted fire-protection cabinets after painting is complete.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire-protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire-protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire-protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire-protection cabinet and mounting bracket manufacturers.
- E. Replace fire-protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes portable, [hand-carried][wheeled] fire extinguishers[and mounting brackets for fire extinguishers].
- B. Owner-Furnished Material: [Hand-carried][Wheeled] fire extinguishers.
- C. Related Requirements:
 - 1. Section 104413 "Fire Protection Cabinets."
 - 2. Section 233813 "Commercial-Kitchen Hoods" for fire-extinguishing systems provided as part of commercial-kitchen exhaust hoods.

1.2 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.
 - 1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:
 - a. Schedules and coordination requirements.
 - b. Ensure invitation is made to AHJ and Owner for locations and types required.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher[and mounting brackets].
- B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.[Use same designations indicated on Drawings.]

1.4 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fire extinguishers to include in maintenance

manuals.

1.6 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace 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 when testing interval required by NFPA 10 is within the warranty period.
 - b. Faulty operation of valves or release levers.
 - 2. Warranty Period: [Six]<Insert number> years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. 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, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each [fire-protection cabinet][and][mounting bracket] indicated.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amerex Corporation]
 - b. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]

- c. [Babcock-Davis]
 - d. [Badger Fire Protection; a Carrier company]
 - e. [Buckeye Fire Equipment Company]
 - f. [Croker; a Division of Morris Group International]
 - g. [Guardian Fire Equipment, Inc]
 - h. [JL Industries; Activar Construction Products Group, Inc.]
 - i. [Kidde; Carrier Global Corporation]
 - j. [Larsen's Manufacturing Company]
 - k. [MOON American, Inc.]
 - l. [Nystrom, Inc.]
 - m. [Potter Roemer LLC; a Division of Morris Group International]
 - n. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
 - o. [Strike First Corporation of America]
 - p. <Insert manufacturer's name>
2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
 3. Valves: [Manufacturer's standard][Nickel-plated, polished-brass body].
 4. Handles and Levers: [Manufacturer's standard][Stainless steel].
 5. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B[, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging].
- B. Stored-Pressure Water Type : UL-rated 2-A, 2.5-gal. nominal capacity, with water in stainless steel container; with pressure-indicating gage.
 - C. Stored-Pressure Antifreeze Water Type : UL-rated 2-A, 2.5-gal. nominal capacity, with water and approved antifreeze solution mixed for temperatures as low as minus 40 deg F in stainless steel container; with pressure-indicating gage.
 - D. Stored-Pressure Water-Mist Type : UL-rated 2-A:C, 2.5-gal. nominal capacity, with water in enameled-steel container; with pressure-indicating gage.
 - E. Pressurized, AFFF-Foam Type : UL-rated [2-A:10-B, 1.6-gal.][3-A:20-B, 2.5-gal.] nominal capacity, with AFFF foam in stainless steel container; with pressure-indicating gage.
 - F. Pressurized, FFFP-Foam Type : UL-rated 3-A:20-B, 2.5-gal. nominal capacity, with FFFP foam in stainless steel container; with pressure-indicating gage.
 - G. Wet-Chemical Type : UL-rated 2-A:1-B:C:K, [1.6-gal.][2.5-gal.] nominal capacity, with potassium [acetate][citrate][carbonate]-based chemical in stainless steel container; with pressure-indicating gage.
 - H. Regular Dry-Chemical Type : UL-rated <Insert capacity> nominal capacity, with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.
 - I. Regular Dry-Chemical Type in Steel Container : UL-rated [2-B:C, 1-lb][10-B:C, 2.5-lb][10-B:C, 5-lb][40-B:C, 5.5-lb][40-B:C, 6-lb][60-B:C, 10-lb][120-B:C, 20-lb] nominal capacity, with sodium bicarbonate-based dry chemical in enameled-steel container.

- J. Regular Dry-Chemical Type in Aluminum Container : UL-rated [2-B:C, 1-lb][10-B:C, 2.5-lb][10-B:C, 5-lb][40-B:C, 5.5-lb][60-B:C, 10-lb][120-B:C, 20-lb] nominal capacity, with sodium bicarbonate-based dry chemical in enameled-aluminum container.
- K. Regular Dry-Chemical Type in Brass Container : UL-rated [40-B:C, 6-lb][60-B:C, 10-lb][120-B:C, 20-lb] nominal capacity, with sodium bicarbonate-based dry chemical in chrome-plated-brass container.
- L. Multipurpose Dry-Chemical Type : UL-rated <Insert capacity> nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.
- M. Multipurpose Dry-Chemical Type in Steel Container : UL-rated [1-A:10-B:C, 2.5-lb][2-A:10-B:C, 5-lb][3-A:40-B:C, 5-lb][3-A:40-B:C, 6-lb][4-A:60-B:C, 10-lb][10-A:120-B:C, 20-lb] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.
- N. Multipurpose Dry-Chemical Type in Aluminum Container : UL-rated [1-A:10-B:C, 2.5-lb][2-A:10-B:C, 5-lb][3-A:40-B:C, 5-lb][3-A:40-B:C, 6-lb][4-A:60-B:C, 10-lb][10-A:120-B:C, 20-lb] nominal capacity, with monoammonium phosphate-based dry chemical in enameled-aluminum container.
- O. Multipurpose Dry-Chemical Type in Brass Container : UL-rated [2-A:10-B:C, 5-lb][3-A:40-B:C, 6-lb][4-A:60-B:C, 10-lb][4-A:80-B:C, 10-lb][10-A:120-B:C, 20-lb] nominal capacity, with monoammonium phosphate-based dry chemical in chrome-plated-brass container.
- P. Purple-K Dry-Chemical Type in Aluminum Container : UL-rated [10-B:C, 2.5-lb][30-B:C, 5-lb][120-B:C, 20-lb] nominal capacity, with potassium bicarbonate-based dry chemical in enameled-aluminum container.
- Q. Purple-K Dry-Chemical Type in Brass Container : UL-rated [80-B:C, 10-lb][120-B:C, 20-lb] nominal capacity, with potassium bicarbonate-based dry chemical in chrome-plated-brass container.
- R. Carbon Dioxide Type : UL-rated [5-B:C, 5-lb][10-B:C, 10-lb][10-B:C, 15-lb][10-B:C, 20-lb] nominal capacity, with carbon dioxide in [manufacturer's standard enameled-metal][enameled-steel][enameled-aluminum] container.
- S. Dry-Powder Type : [FM approved,]UL-rated Class D, 30-lb nominal capacity, with [sodium chloride][copper]-based powder in enameled-steel container; with pressure-indicating gage.
- T. Halon Type : [5-B:C, 2.5-lb][10-B:C, 5-lb] nominal capacity, in enameled-steel container; with pressure-indicating gage.
 - 1. UL-rated.
- U. Clean-Agent Type in Aluminum Container : UL-rated [1-B:C, 1.4-lb][2-B:C, 2.5-lb][5-B:C, 5-lb] nominal capacity, with HCFC Blend B agent and inert material in enameled-aluminum container; with pressure-indicating gage.

- V. Clean-Agent Type in Brass Container : UL-rated [1-A:10-B:C, 11-lb][2-A:10-B:C, 15.5-lb] nominal capacity, with HCFC Blend B agent and inert material in chrome-plated-brass container; with pressure-indicating gage.
- W. Clean-Agent Type in Steel Container : UL-rated [5-B:C, 4.75-lb][1-A:10-B:C, 10-lb][2-A:10-B:C, 14-lb] nominal capacity, with HFC blend agent and inert material in enameled-steel container; with pressure-indicating gage.

2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard[galvanized] steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or [red][black] baked-enamel finish.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amerex Corporation]
 - b. [Ansul; brand of Johnson Controls International plc, Building Solutions North America]
 - c. [Babcock-Davis]
 - d. [Badger Fire Protection; a Carrier company]
 - e. [Buckeye Fire Equipment Company]
 - f. [Croker; a Division of Morris Group International]
 - g. [Guardian Fire Equipment, Inc]
 - h. [JL Industries; Activar Construction Products Group, Inc.]
 - i. [Kidde; Carrier Global Corporation]
 - j. [Larsen's Manufacturing Company]
 - k. [Nystrom, Inc.]
 - l. [Potter Roemer LLC; a Division of Morris Group International]
 - m. [Pyro-Chem; brand of Johnson Controls International plc, Building Solutions North America]
 - n. [Strike First Corporation of America]
 - o. <Insert manufacturer's name>
 - 2. Source Limitations: Obtain mounting brackets and fire extinguishers from single source from single manufacturer.
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
 - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
 - a. Orientation: [Vertical][Horizontal].

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fire extinguishers for proper charging and tagging.
 - 1. Remove and replace damaged, defective, or undercharged fire extinguishers.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Install fire extinguishers[and mounting brackets] in locations indicated and in compliance with requirements of authorities having jurisdiction.
- B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
 - 1. Mounting Height: Top of fire extinguisher to be at [42 inches]<Insert dimension> above finished floor.

END OF SECTION 10 44 16

SECTION 11 12 00 - PARKING CONTROL EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Automatic barrier gates.
2. Entry terminals.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for pipe bollards to protect parking control equipment.
2. Section 133423.16 "Fabricated Control Booths" for cashiers'/parking attendants' booths.
3. Section 281300 "Access Control Software and Database Management" for integrating parking control equipment with building access control.
4. Section 281500 "Access Control Hardware Devices" for parking control equipment access devices.
5. Section 283100 "Intrusion Detection" for integrating parking control equipment with the building intrusion detection system.
6. Section 283121 "Area and Perimeter Intrusion Detection" for integrating parking control equipment with the site security control system.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at [Project site]<Insert location>.

1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
2. Verify that equipment operation is consistent with system description.
3. Review sequence of operation for each type of parking control equipment.
4. Review coordination of interlocked equipment specified in this Section and elsewhere.
5. Review required testing, inspecting, and certifying procedures.
6. <Insert requirement>.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for parking control equipment.
2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties.

- B. Shop Drawings: For parking control equipment.
 - 1. Include plans, elevations, sections and attachment details.
 - 2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 3. Include diagrams for power, signal, and control wiring.
 - 4. Vehicle Detectors: Layout and method of placement of vehicle loop detector system.
- C. Samples: For each exposed product and for each color and texture specified, 6 inches square in size.
- D. Samples for Initial Selection: For units with factory-applied finishes.
- E. Samples for Verification: For each type of exposed finish 6 inches square in size.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For parking control equipment to include in emergency, operation, and maintenance manuals.
- B. Software and Firmware Operational Documentation:
 - 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On [USB media][and][approved online or cloud solution].
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Gate Arms: [Two]<Insert number> breakaway gate arms for each gate installed, complete with accessory components.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. Parking Control System: For the following types of parking management:
 - 1. Limited Date and Time Parking: Limited-duration parking, with predetermined fee access control card.
- B. Electrical Components and Devices: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 SOURCE LIMITATIONS

- A. Obtain [parking control equipment]<Insert equipment> from single source from single manufacturer.

2.3 AUTOMATIC BARRIER GATES

- A. Automatic Barrier Gates: Provide parking control device consisting of cantilevered sliding barrier operator and controller housed in a weathertight, tamper-resistant cabinet enclosure with gate arm. Device shall be activated by a signal from access or revenue control device.
 - 1. Manufacturers: See civil drawings for gate style and manufacturer
 - 2. Standards: Barrier gate operators that are listed and labeled according to UL 325 by a qualified testing agency.
- B. Controller: Factory-sealed, solid-state, plug-in type, with galvanized-steel box for wiring connections.][Communicating] type.
 - 1. Communicating Type:
 - a. Real-time communication of lane counts, status messages, and execute commands.
 - b. Communication commands for resetting loops, turning "Full" signs on/off, sliding gate, and disabling
 - 2. Physical Characteristics:
 - a. On-off power supply switch.
 - b. Automatic-manual switch.
 - c. Differential counter.
 - d. Communication port.
 - e. Internal [resettable][non-resettable] counters.
 - f. Thermal-overload protection with manual reset.
 - g. Plug-in connectors for [two][three] vehicle loop detectors.
 - h. Thermostatically controlled heater with on/off/auto switch.
 - i. Thermostatically controlled fan with on/off/auto switch.

- j. Switch to test motor and limit switches.
 - k. Emergency manual disconnect.
 - l. Battery backup.
 - m. [Single][Two][Four], 115-V ac grounded power receptacle.
3. Operational Characteristics:
- a. Able to store successive inputs and sequentially processing each one.
 - b. Automatic instant-reversing obstacle detector mechanism that stops downward motion of gate arm if arm contacts or nears an object and that immediately returns arm to upward position. Include a zero- to 60-second, variable-time reset device.
 - c. Directional arming logic.
 - d. Broken gate-arm monitoring.
 - e. Programmable[automatic] timer.
 - f. Diagnostic mode for on-site testing[, with LEDs for inputs and outputs].
 - g. Automatic and continuous testing of inputs and outputs.
 - h. Reversible arm capability for right- or left-handed operation.
- C. Cabinets: Fabricated from sheet metal with seams welded and ground smooth; approximately 15 inches square by 40 inches tall. Provide single, gasketed access door for each cabinet with flush-mounted locks. Furnish [two]<Insert number> keys for each lock[, all locks keyed alike]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet.
- 1. Steel Sheet: Not less than 0.097-inch- thick[, galvanized-] steel sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
 - 2. Aluminum Sheet: Not less than 0.125-inch- thick, aluminum sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
 - 3. Stainless-Steel Sheet: Not less than 0.109-inch- thick, stainless-steel sheet.
 - a. Finish cabinet exterior with No. 4 finish.
- D. Operator: UL labeled and listed, [Class I][Class II][Class III][Class IV]. [1/3][1/2] hp; <Insert number>-V, 60-Hz, single-phase, instant-reversing, continuous-duty motor for operating gate arm. Transmit power to gate-arm drive shaft through the speed reducer to harmonic-acting crank and connecting rod. Fabricate crank, rod, and drive shaft of galvanized solid bar steel. Provide an operable cam for adjusting arm travel.
- 1. Opening Time: owner determined
 - 2. Inherently adjustable, torque limiting clutch for safety.
- E. Characteristics:
- 1. Audible alarm that activates as part of a safety device system.

2. Additional obstruction detector; noncontact [infrared][photoelectric][radio-frequency barrier].
3. Manually operated crank for emergency operation.
4. Authorities having jurisdiction's emergency access by

2.4 ENTRY TERMINALS

- A. Entry Terminals: Provide entry terminals with mechanisms, components, and controllers housed in cabinet enclosures.
1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Amano Cincinnati, Inc]
 - b. [ASPS Access Security & Parking Systems Inc.]
 - c. [CAME Americas Automation LLC]
 - d. [Canadian Parking Equipment Ltd./American Parking Equipment Inc.]
 - e. [Engineered Parking Systems, Inc]
 - f. [Falcon Eye Global Security, LLC]
 - g. [Parking Systems, Inc.]
 - h. [Zeag; HUB Parking Technology; FAAC Group]
 - i. <Insert manufacturer's name>
- B. Physical Characteristics:
1. Digital display, touchscreen, or LCD.
 2. Battery backup for clock and RAM memory.
 3. Communication port.
 4. Access card reader.
- C. Operational Characteristics:
1. Operation: [Standalone][Online communication to remote computer].
 2. Activation by [button with "Push for Ticket" message][vehicle detector][credit card in/out][license plate recognition][automatic vehicle identification][proximity][scanned electronic or hardcopy media][access card]<Insert device>.
 - a. On activation by button, unit automatically records entry time[, license plate,] and date on ticket[, sounds buzzer,] dispenses ticket, and raises barrier gate.
 - b. On activation by means other than button, credentials are recorded and signal is automatically sent to raise barrier gate.
- D. Cabinets: Fabricated from sheet metal with seams welded and ground smooth, approximately 15 inches square by 40 inches tall; consisting of base and top components. Provide single, gasketed access door for each base component with flush-mounted locks. Furnish [two]<Insert number> keys for each lock[, all locks keyed]

alike]. Fabricate cabinet with internal reinforcing and four mounting holes accessible only from inside cabinet. Fabricate top component so it can be unlocked and opened for ticket loading and maintenance. Include flush-mounted lock in rear of top, keyed the same as base component lock.

1. Steel Sheet: Not less than 0.097-inch- thick[, galvanized-] steel sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
2. Aluminum Sheet: Not less than 0.125-inch- thick, aluminum sheet.
 - a. Finish cabinet, interior and exterior, with manufacturer's standard [white][yellow]<Insert color> baked-enamel or powder-coat finish.
3. Stainless-Steel Sheet: Not less than 0.109-inch- thick, stainless-steel sheet.
 - a. Finish cabinet exterior with No. 4 finish.

2.5 ANCHORAGES

- A. Anchor Bolts: [Galvanized][Stainless steel].
 1. Hot-dip galvanized according to ASTM A153/A153M and ASTM F2329/F2329M.
 2. Stainless steel, [Type 304][Type 316][Type 304 or 316 as indicated]<Insert type>.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, including equipment bases; accurate placement, pattern, and orientation of anchor bolts; critical dimensions; and other conditions affecting performance of the Work.
- B. Examine roughing-in for electrical and communication systems to verify actual locations of connections before parking control equipment installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Excavation for Traffic Controllers: Saw cut existing pavement for recessed traffic controllers and hand-excavate recesses to dimensions and depths and at locations as required by traffic controller manufacturer's written instructions and as indicated on Drawings.

3.3 INSTALLATION, GENERAL

- A. Install parking control equipment as required for complete and integrated installation.

- 1. Rough-in electrical connections.

3.4 INSTALLATION OF AUTOMATIC BARRIER GATES

- A. Anchor cabinets to concrete bases with anchor bolts or expansion anchors, and mount barrier gate arms.

- 1. Install barrier gates according to UL 325.

3.5 INSTALLATION OF VEHICLE DETECTORS

- A. [Cut grooves in pavement and bury][Bury] and seal wire loop at locations indicated on Drawings according to manufacturer's written instructions. Connect to parking control equipment operated by detector.

3.6 INSTALLATION OF ENTRY TERMINALS

- A. Attach cabinets to concrete bases with anchor bolts or expansion anchors.

- 1. Connect equipment to remote computer.
 - 2. Load ticket dispenser with supply of tickets.

3.7 INSTALLATION OF CARD READER PEDESTALS

- A. [Pad][In-ground] mount with mounting bolts.

3.8 INSTALLATION OF ELECTRICAL

- A. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

3.9 FIELD QUALITY CONTROL

- A. Testing Agency: [Owner will engage][Engage] a qualified testing agency to perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.

- C. Perform the following tests and inspections[with the assistance of a factory-authorized service representative]:
 - 1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.
 - 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Parking control equipment will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.10 ADJUSTING

- A. Adjust parking control equipment to function smoothly, and lubricate as recommended by manufacturer.
- B. Confirm that locks engage accurately and securely without forcing or binding.
- C. After completing installation of exposed, factory-finished parking control equipment, inspect exposed finishes and repair damaged finishes.

3.11 PROTECTION

- A. Remove barrier gate arms during the construction period to prevent damage, and install them immediately before Substantial Completion.

3.12 MAINTENANCE SERVICE

- A. Maintenance Service Description: Beginning at Substantial Completion, maintenance service shall include [three][six][nine][12] months' full maintenance by [skilled employees of parking control equipment Installer][manufacturer's authorized service representative]. Include monthly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper parking control equipment operation. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

3.13 SOFTWARE SERVICE AGREEMENT

- A. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for [two]<Insert number> years.
- B. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within [two]<Insert number> years from date of Substantial Completion. Upgrading software shall include operating

system and new or revised licenses for using software.

1. Upgrade Notice: At least [30]<Insert number> days to allow Owner to schedule and access the system and to upgrade computer equipment if necessary.

3.14 DEMONSTRATION

- A. [Engage a factory-authorized service representative to train][Train] Owner's maintenance personnel to adjust, operate, and maintain parking control equipment.

END OF SECTION 11 12 00

SECTION 11 13 13 - LOADING DOCK BUMPERS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes loading dock bumpers.
- B. Related Requirements:
 - 1. Section 111319 "Stationary Loading Dock Equipment" for loading dock bumpers that are integral with dock levelers.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of loading dock bumper.
- B. Shop Drawings: For dock bumpers. Include plans, elevations, sections, and attachment details.

PART 2 - PRODUCTS

2.1 LOADING DOCK BUMPERS

- A. Dock Bumpers: Surface-mounted bumpers; of type, size, and construction indicated; designed to absorb kinetic energy and minimize damage to loading dock structure.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [American Floor Products Company, Inc]
 - b. [Beacon Industries, Inc]
 - c. [Chalfant Sewing Fabricators, Inc]
 - d. [Durable Corporation]
 - e. [Hugger Dock Equipment Company; Columbus Foam Products, Inc.]
 - f. [Kelley; Entrematic; ASSA ABLOY]
 - g. [Pioneer Dock Equipment]
 - h. [Rite-Hite Holding Corporation]
 - i. [Rotary Products Inc]
 - j. [Serco; Entrematic; ASSA ABLOY]
 - k. [Super Seal Mfg. Ltd]
 - l. [Vestil Manufacturing Company]
 - m. <Insert manufacturer's name>

2. Source Limitations: Obtain from single source from single manufacturer.
- B. Laminated-Tread Loading Dock Bumper : Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch- 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 of tread plies extending beyond the face of closure angles.
1. Thickness: [4-1/2 inches][6 inches][As indicated on Drawings]<Insert dimension>.
 2. Horizontal Style: [6 inches][10 inches][12 inches] high by [length indicated on Drawings]<Insert dimension>.
 3. Vertical Style: 8 inches wide by [20 inches high][24 inches high][36 inches high][height indicated on Drawings]<Insert dimension>.
- C. Molded-Rubber Loading Dock Bumpers : Fabricated from molded-rubber compound reinforced with nylon, rayon, or polyester cord; with Shore A durometer hardness of 80, plus or minus 5, when tested according to ASTM D2240; of size and configuration indicated. Fabricate units with not less than two predrilled anchor holes.
1. Configuration: [T shape][Inverted-L shape][Square][Rectangular][As indicated on Drawings]<Insert configuration>.
 2. Thickness: [2 inches][3 inches][4 inches][6 inches][As indicated on Drawings]<Insert dimension>.
- D. Extruded-Rubber Loading Dock Bumpers : Fabricated from ASTM D2000, extruded synthetic rubber with Shore A durometer hardness of 75, plus or minus 5, when tested according to ASTM D2240; of size and configuration indicated. Furnish units with predrilled anchor holes and concealed, flat, steel mounting bar.
1. Configuration: [Flat or ribbed, with 2-inch nominal thickness and 9-inch height][4-1/2-inch- wide base and 4-inch depth with half-oval shape that compresses and returns to original shape][As indicated on Drawings]<Insert configuration>.
- E. Steel-Face, Laminated-Tread Loading Dock Bumpers : Fabricated from multiple, uniformly thick plies cut from fabric-reinforced rubber tires and with 3/8-inch steel faceplate of same size as rubber surface. Laminate plies under pressure on not less than two 3/4-inch- diameter, steel supporting rods that are welded at one end to 1/4-inch- 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 of tread plies extending beyond the face of closure angles. Weld faceplate to two steel support brackets, which shall extend back to and engage 3/4-inch- diameter support rods in elongated holes, allowing steel face to float on impact.
1. Thickness: [4-1/2 inches][6 inches][As indicated on Drawings]<Insert dimension>.
 2. Horizontal Style: [6 inches][10 inches][12 inches] high by [length indicated on Drawings]<Insert dimension>.
 3. Vertical Style: 8 inches wide by [20 inches high][24 inches high][36 inches high][height indicated on Drawings]<Insert dimension>.
- F. Anchorage Devices: 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. Hot-dip galvanized according to ASTM A153/A153M or ASTM F2329/F2329M.

- G. Materials: ASTM A36/A36M for steel plates, shapes, and bars. Hot-dip galvanize according to ASTM A123/A123M.

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

3.2 INSTALLATION, GENERAL

- A. Loading Dock Bumpers: Attach loading 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.

3.3 ADJUSTING

- A. After completing installation of exposed, factory-finished dock bumpers, inspect exposed finishes and repair damaged finishes.

END OF SECTION 11 13 13

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Manually operated, single-roller shades.

B. Related Requirements:

1. Section 057500 "Decorative Formed Metal" for shade pockets not provided by roller window shade manufacturer.
2. Section 061000 "Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
3. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.
4. Section 260010 "Supplemental Requirements for Electrical" for additional requirements applicable to coordinating, scheduling, and sequencing of the electrical Work specified in this Section.

1.2 ALLOWANCES

- A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 ALTERNATES

- A. See Section 012300 "Alternates" for description of alternates affecting items specified in this Section.

1.4 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
 - a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
 - b. Include rated capacities, operating characteristics,[electrical characteristics,] features, and furnished accessories.
 - c. <Insert requirements>.

B. Shop Drawings:

1. Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
 2. Motor-Operated Shades: Include diagrams for power, signal, and control wiring.
 3. <Insert requirements>.
- C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type and color of shadeband material and for each type of exposed finish.
1. Include Samples of accessories involving color selection.
- D. Samples for Verification: Actual sample of finished products for each type of roller shade including actual shadeband material and installation accessories.
1. Size: [Manufacturers' standard size]<Insert size>.
- E. Product Schedule: For roller shades.[Use same designations indicated on Drawings.]
- F. Sustainable Design Submittals:

1.5 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of shadeband material.
- B. Product Test Reports: For each type of shadeband material, for tests performed by [a qualified testing agency][manufacturer and witnessed by a qualified testing agency].
- C. Qualification Statements: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For roller shades.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Extra Stock Material: Furnish extra materials[, from the same production run,] to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Roller Shades: Full-size units equal to [3][5]<Insert number> percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than [two]<Insert number> units. Include mounting accessories.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

1.9 MOCKUPS

- A. Install [one]<Insert number> of each type of roller window shade as a mockup to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.11 FIELD CONDITIONS

- A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.12 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of products that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Defects in materials and workmanship beyond normal wear and tear.
 - b. Faulty operation of operating system components.
 - c. Deterioration of fabric beyond normal use.
 - d. <Insert conditions relating to specified products>.
 - 2. Warranty Period:
 - a. Roller Window Shades: 10year(s) from date of Substantial Completion.
 - b. Motorized Components: [Five] year(s) from date of Substantial Completion.
 - c. Fabric: 10] year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

- A. Obtain roller shades from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. Window Covering Safety Standard: Provide roller window shades that comply with WCMA A100.1[and are listed and labeled as "Best for Kids" by a qualified testing agency].
- B. Fire Performance: Tested in accordance with and meeting the flame propagation performance criteria of Test 1 or Test 2, as appropriate, of NFPA 701; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
 - 1. Listing Criteria: Investigated, labeled, and marked by qualified electrical testing laboratory in accordance with guide information and standards specified for the following UL product categories:
 - a. Drapery Operators: UL CCN FDDR, including UL 325.
- D. Accessibility Standards: Comply with applicable provisions in [the USDOJ's "2010 ADA Standards for Accessible Design"] [and] [ICC A117.1] <Insert accessibility regulation> for roller window shades designated as accessible.

2.3 MANUALLY OPERATED ROLLER WINDOW SHADES

- A. Manually Operated, Single-Roller Shades: For interior use in rectangular openings.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following] [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [BTX Intelligent Fashion, LLC]
 - b. [CACO, Inc.]
 - c. [DFB Sales, Inc.]
 - d. [Draper, Inc.]
 - e. [Hunter Douglas Architectural Window Coverings]
 - f. [Insolroll Window Shading Systems]
 - g. [Lafayette Interior Fashions]
 - h. [Legrand Shading Systems; Legrand North America, LLC]
 - i. [Levolor Inc.]

- j. [Lutron Electronics Co., Inc]
 - k. [MechoShade Systems, LLC]
 - l. [Rollease Acmeda Inc.]
 - m. [Springs Window Fashions; SWFcontract]
 - n. <Insert manufacturer's name>
2. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- a. Roller Drive-End Location: [Right side of interior face of shade][Left side of interior face of shade][As indicated on Drawings]<Insert requirements>.
 - b. Direction of Shadeband Roll: [Regular, from back (exterior face) of roller][Reverse, from front (interior face) of roller].
 - c. Shadeband-to-Roller Attachment: [Manufacturer's standard method][Adhesive strip][Removable spline fitting into integral channel in tube]<Insert description>.
3. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to six inline rollers into a multiband shade that is operated by one roller drive-end assembly.
4. Shadebands:
- a. Shadeband Material: [Light-filtering fabric][Light-blocking fabric][Acoustical fabric]<Insert requirements>.
 - b. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
 - 1) Type: [Elliptical slat enclosed in sealed pocket of shadeband material][Elliptical slat with endcaps, enclosed in open pocket of shadeband material][Exposed flat bar with endcaps][Exposed round bar with endcaps][Exposed tube with endcaps][Manufacturer's standard exposed bottom bar with integral light seal]<Insert description>.
 - 2) Color and Finish: [As selected by Architect from manufacturer's full range]<Insert color and finish>.
5. Mounting Hardware: Brackets or endcaps, with endcap covers where exposed, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and installation location and conditions indicated.
6. Installation Accessories:
- a. Front Fascia: Aluminum extrusion that conceals front and underside of roller and shadeband assembly and attaches to roller endcaps without exposed fasteners.
 - 1) Shape: [L-shaped][Curved]<Insert requirements>.
 - 2) Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than [4 inches][3 inches]<Insert dimension>.

- b. Exposed Headbox: Extruded-aluminum enclosure including front fascia, L-shaped top/back cover, and removable bottom closure, that fully conceals roller and shadeband assembly, and attaches to roller endcaps without exposed fasteners.
 - 1) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than [4 inches][3 inches][height indicated on Drawings]<Insert dimension>.
- c. Recessed Shade Pocket:
 - 1) U-shaped, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, and with removable bottom closure panel and end caps or plates.[Provide pocket with lip at lower edge to support acoustical ceiling panel.]
 - a) Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than [6 inches][5 inches][4 inches][height indicated on Drawings]<Insert dimension>.
 - 2) As specified in Section 057500 "Decorative Formed Metal."
- d. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
 - 1) Closure-Panel Width: [As indicated on Drawings][2 inches]<Insert dimension>.
- e. Side Channels: Extruded aluminum "U" channel with light seals, designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
- f. Bottom (Sill) Channel or Angle: Extruded aluminum "U" channel or "L" angle with light seals, designed to eliminate light gaps at bottoms of shades when shades are closed.
- g. Installation Accessories Color and Finish: [As selected from manufacturer's full range]<Insert color and finish>.

2.4 MANUAL OPERATION

A. Manual Corded Operation:

- 1. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
 - a. Bead Chains: [Manufacturer's standard][Nickel-plated metal][Stainless

steel][Plastic]<Insert description> bead chain with WCMA A100.1 compliant tension device installed on roller window shade by manufacturer and mounted on [wall][jamb][sill].

- 1) Loop Length: [Full length of roller shade][As indicated on Drawings]<Insert length>.
- 2) Limit Stops: Provide upper and lower ball stops.

b. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.

- 1) Provide for shadebands that weigh more than [10 lb]<Insert value> or for shades as recommended by manufacturer, whichever criterion is more stringent.

B. Manual Cordless Operation:

1. Crank-and-Gear Operating Mechanisms: Sealed gearbox drive system controlled by crank handle.
 - a. Crank-Handle Type: [Detachable][Permanently mounted].
 - b. Crank-Handle Length: [6 ft.][10 ft.][Manufacturer's standard][As indicated on Drawings]<Insert length>.

2.5 MOTORIZED OPERATION

A. Motorized Operating Systems: Factory-assembled, motorized roller window shades with shade-operator system of size and capacity and with features, characteristics, and accessories required for conditions indicated, complete with motor and factory-prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for complete operation. For wired controls, include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Type:

1. Standard Motor with Wired Controls: Roller window shade manufacturer's standard tubular motor to suit conditions indicated, enclosed in roller.
 - a. Motor Electrical Characteristics: [120-V ac][24-V dc]<Insert requirements>.
 - b. Motor Functions:
 - 1) Quiet Operation Motor: <Insert requirements>.
 - 2) Third-Party Integration Capability: <Insert requirements>.
 - 3) <Insert description>.
 - c. Controls:
 - 1) Wired Wall Switch:
 - a) Single Motor Control: Wired wall-switch-operated control

station for single motor control, with three switch positions for open, close, and center stop functions. [Single station, dry-contact, three-button wall switch][Double station, dry-contact, three-button wall switch][Maintained-contact paddle switch][Momentary-contact paddle switch][Maintained-contact rocker switch][Momentary-contact rocker switch][Maintained-contact toggle switch][Momentary-contact toggle switch][Maintained-contact key switch; provide two keys per station][Momentary-contact key switch; provide two keys per station].

- b) Group Motor Control, Two Motors: Wired wall-switch-operated control station for control of two motors together with single station, with three switch positions for open, close, and center stop functions. [Maintained][Momentary]-contact, [paddle][rocker] switch.
- c) Group Motor Control, Two to Five Motors: Wired wall-switch-operated control station for control of [two][three][four][five] motors together with single station, with five switch positions for open, close, and three preset intermediate stop position functions. [Single station, dry-contact, five- or six-button wall switch][Double station, dry-contact, five- or six-button wall switch].
- d) Color: [White][Ivory][As selected by Architect from manufacturer's full range]<Insert color>.

d. Accessories:

- 1) <Insert description>.

2. Radio Frequency (RF) Motor with Wireless Controls: Roller window shade manufacturer's standard tubular radio frequency motor to suit conditions indicated, enclosed in roller, communicating to control devices through wireless RF signal.

- a. Motor Electrical Characteristics: [120-V ac][24-V dc][12-V dc, battery]<Insert requirements>.

b. Motor Functions:

- 1) Quiet Operation Motor: <Insert requirements>.
- 2) Third-Party Integration Capability: <Insert requirements>.
- 3) <Insert description>.

c. Controls:

1) RF Wireless Wall Switch Transmitters:

- a) Single Channel [Surface-Mount] Wall Switch: With open, close, and stop command buttons, and one channel button for operation of one motorized shade or one group of motorized shades.
- b) Multi-Channel [Surface-Mount] Wall Switch: With open, close,

and stop command buttons and [two][three][four][five] channel buttons for operation of one motorized shade or one group of motorized shades per channel.

- c) Color: [As selected by Architect from manufacturer's full range]<Insert color>.

2) RF Handheld Transmitters:

- a) Single-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades[, and with sun sensor control].
- b) Multi-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades per channel for up to five channels[, and with sun sensor control].
- c) 16-Channel Handheld Remote: For operation of one motorized shade or one group of motorized shades per channel for up to 16 channels.
- d) Color: [As selected by Architect from manufacturer's full range]<Insert color>.

3) RF Wireless Tabletop Controls:

- a) Single Channel Tabletop Control: With open, close, and stop command buttons and one channel button for operation of one motorized shade or one group of motorized shades, compatible with RF wireless wall switch transmitters.
- b) Multi-Channel Tabletop Control: With open, close, and stop command buttons and [two][three][four][five] channel buttons for operation of one motorized shade or one group of motorized shades per channel, compatible with RF wireless wall switch transmitters.
- c) Color: [As selected by Architect from manufacturer's full range]<Insert color>.

4) App-Based Mobile Device and Voice Control:

- a) Multi-channel control for up to [16][40]<Insert number> RTS channels programmable for individual or group control, schedules, scenes, or timed events, and with voice control through digital assistants.

5) RF Wireless Sensors:

- a) Sun Sensor: Programmable sensor detects sun intensity and responds by automatically adjusting motorized shades.
- b) Sun and Temperature Sensor: Programmable sensor detects sun intensity and temperature and responds by automatically adjusting motorized shades.

6) RF Timer Control:

- a) Single-Channel Handheld Transmitter: For operation of one motorized shade or one group of motorized shades, programmable for weekday and weekend schedules with one open and close schedule per day.
 - b) Color: [As selected by Architect from manufacturer's full range]<Insert color>.
 - d. Accessories:
 - 1) <Insert description>.
- 3. Intelligent Motor with Wired Controls: Roller window shade manufacturer's standard tubular intelligent motor to suit conditions indicated, enclosed in roller. Intelligent motors and controls each with individual IP addresses, communicating together with two-way communication, and connected into a digital network system.
 - a. Motor Electrical Characteristics: 120-V ac <Insert requirements>.
 - b. Motor Functions:
 - 1) Quiet Operation Motor: <Insert requirements>.
 - 2) <Insert requirements>
 - c. Network Functions:
 - 1) Standalone network.
 - 2) Integrate with building management system.
 - 3) Integrate with third-party [lighting][audiovisual (A/V)], [HVAC]<insert description> control systems.
 - 4) Whole building automation. Provide manufacturer's standard whole building automation system using web-based user interface and required devices to provide the following functions:
 - a) Automatically adjust shade positions based on sky conditions, solar heat gain, sun tracking, direct and diffuse radiation, and occupancy.
 - b) Override capability.
 - c) Integrate with building management system.
 - d) Integrate with third-party control systems including lighting control systems, audiovisual (A/V) systems, HVAC control systems and energy dashboards.
 - e) Data logging, reporting and storage.
 - f) Individual user profiles and permissions.
 - g) Programming of scheduled events.
 - h) Display and monitoring of current conditions.
 - i) Send alerts/notifications.
 - j) Configurable motor, zone, and building properties.
 - k) <Insert requirements>
 - 5) <Insert requirements>

d. Controls:

- 1) Master-Controlled/Central Network Controller: Touchscreen device for whole building automation control.
 - 2) Wired Wall Switch:
 - a) Single Zone Intelligent [Push-Button][Touch or Swipe] Wall Switch: For control of one motorized shade or one zone composed of any number of motorized shades in the network.
 - b) Dual Zone Intelligent [Push-Button][Touch or Swipe] Wall Switch: For control of two individual zones, each zone composed of any number of motorized shades in the network.
 - c) Color: [As selected by Architect from manufacturer's full range]<Insert color>.
 - 3) Wireless Handheld Remote:
 - a) Multi-Channel RF Handheld [Push-Button][Touch or Swipe] Remote: For wireless control of one motorized shade or one group of motorized shades per channel for up to 32 channels. Provide manufacturer's standard network gateway device to enable use of wireless control device on wired network.
 - b) Color: [As selected by Architect from manufacturer's full range]<Insert color>.
 - 4) Wired Sensors:
 - a) Internal Daylight Sensor: Measures daylight levels through glazing and responds by automatically adjusting motorized shades. Provide manufacturer's standard network interface device[with automated glare control,] to connect sensors to network. Interface device to allow programming for up to [eight]<insert number> scheduled events.
 - b) External Brightness Sensor: Measures brightness levels and responds by automatically adjusting motorized shades. Provide manufacturer's standard network interface device[with automated glare control,] to connect sensors to network. Interface device to allow programming for up to [eight]<insert number> scheduled events.
 - c) <Insert sensor>.
- C. Crank-Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
- D. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.
- E. Maximum Total Shade Width: [As required to operate roller shades indicated]<Insert requirements>.
- F. Maximum Shade Drop: [As required to operate roller shades indicated]<Insert

requirements>.

- G. Maximum Weight Capacity: [As required to operate roller shades indicated]<Insert requirements>.

2.6 SHADEBAND MATERIALS

- A. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: [Roller shade manufacturer]<Insert source for custom fabrics>.
2. Type: [PVC-coated fiberglass][PVC-coated polyester][Woven 100 percent polyester][100 percent fiberglass][Thermoplastic Olefin (TPO)][Acrylic-coated polyester][Woven PVC-coated fiberglass and PVC-coated polyester][Woven polyester and PVC-coated polyester][PVC-coated polyester with silver backing]<Insert description>.
3. Weave: [Mesh][Basketweave]<Insert description>.
4. Thickness: <Insert thickness>.
5. Weight: <Insert oz./sq. yd.>.
6. Roll Width: [36 inches][48 inches][60 inches][72 inches][84 inches]<Insert dimension>.
7. Orientation on Shadeband: [Up the bolt][Railroaded][As indicated on Drawings]<Insert requirements>.
8. Openness Factor: [0.5][1][3][5][10][11][22]<Insert number> percent.
9. Color: [As indicated on Drawings][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

- B. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: [Roller shade manufacturer]<Insert source for custom fabrics>.
2. Type: [Fiberglass with PVC film bonded to both sides][Fiberglass with acrylic flocked backing][Woven 100 percent polyester][Acrylic-coated polyester][Polyester-acrylic blend][Polyester with acrylic foamed backing][PVC-coated fiberglass with bonded PVC film][Fiberglass with EVA coating][PVC-coated polyester with silver backing]<Insert description>.
3. Thickness: <Insert thickness>.
4. Weight: <Insert oz./sq. yd.>.
5. Roll Width: [36 inches][48 inches][60 inches][72 inches][84 inches]<Insert dimension>.
6. Orientation on Shadeband: [Up the bolt][Railroaded][As indicated on Drawings]<Insert requirements>.
7. Features: [Washable][Antistatic treatment]<Insert requirements>.
8. Color: [As indicated on Drawings][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

- C. Acoustical Fabric: Woven fabric, stain and fade resistant.

1. Source: [Roller shade manufacturer]<Insert source for custom fabrics>.
2. Type: [Woven 100 percent polyester][Thermoplastic Olefin (TPO)][PVC-coated fiberglass][PVC-coated polyester]<Insert description>.
3. Acoustical Performance: Sound absorption [NRC][or][SAA] of [0.60 to 0.70][0.50

- to 0.60][0.40 to 0.50][0.30 to 0.40][0.20 to 0.30][not less than 0.50]<Insert range or single value> in accordance with ASTM C423 for Type G mounting in accordance with ASTM E795.
4. Thickness: [As required to meet acoustical performance]<Insert thickness>.
 5. Weight: [As required to meet acoustical performance]<Insert oz./sq. yd.>.
 6. Roll Width: [36 inches][48 inches][60 inches][72 inches][84 inches]<Insert dimension>.
 7. Orientation on Shadeband: [Up the bolt][Railroaded][As indicated on Drawings]<Insert requirements>.
 8. Features: [Washable][Antistatic treatment]<Insert requirements>.
 9. Openness Factor: [0.5][1][3][As required to meet acoustical performance]<Insert number> percent.
 10. Color: [As indicated on Drawings][Match Architect's sample][As selected by Architect from manufacturer's full range]<Insert color>.

2.7 FABRICATION OF ROLLER WINDOW SHADES

- A. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
 1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.
 2. Outside of Jamb Installation: Width and length as indicated [in window-treatment schedule][on Drawings]<Insert requirements>, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.
- B. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:
 1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than [1:4]<Insert ratio>, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
 2. Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.
 3. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, [locations of connections to building electrical system,]and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF ROLLER WINDOW SHADES

- A. Install roller shades level, plumb, aligned and centered on openings, and aligned with adjacent units in accordance with manufacturer's written instructions.
 - 1. Located so shadeband is not closer than [2 inches]<Insert dimension> to interior face of glass. Allow clearances for window operation hardware.
- B. Roller Shade Locations: [At exterior windows][As indicated in window-treatment schedule][As indicated on Drawings]<Insert requirements>.
- C. Electrical:
 - 1. Connect motor-operated roller window shades to building electrical system.
 - 2. Comply with manufacturer's written installation instructions.

3.3 ADJUSTING

- A. Adjust and balance roller window shades to operate smoothly, easily, safely, and free from binding or malfunction through full operational range.

3.4 CLEANING AND PROTECTION

- A. Clean roller window shade surfaces, after installation, in accordance with manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller window shades are without damage or deterioration at time of Substantial Completion.
- C. Protect electrical[and communications] wiring, cabling, raceways, and boxes, after installation. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use, before time of substantial completion.
- D. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller window shades.

END OF SECTION 12 24 13

SECTION 12 36 61 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.
2. Quartz agglomerate countertops.

B. Related Requirements:

1. Section 055000 "Metal Fabrications" for cantilever supports.
2. Section 224100 "Residential Plumbing Fixtures" and Section 224200 "Commercial Plumbing Fixtures" for non-integral sinks and plumbing fittings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of countertop material[and sink].

B. Shop Drawings:

1. Plans, sections, details, edge and backsplash profiles, and attachment to other work.
2. Locations and details of joints.
3. Locations, quantity, and type of supports/brackets.
4. Direction of directional pattern, if any.
5. Locations and sizes of cutouts and holes for items installed in countertop.
6. Apply [AWI's Quality Certification][WI's Certified Compliance] Program label to Shop Drawings.

C. Samples for Initial Selection: For each type of material exposed to view.

D. Samples for Verification:

1. Countertop material, 6 inches square.
2. One full-size countertop, with front edge[and backsplash], 8 by 10 inches, of construction and in configuration specified.

E. Sustainable Design Submittals:

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Indicate locations and sizes of cutouts and holes for items installed in countertops or backsplashes.

- B. Qualification Statements: For fabricator.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For solid surface material countertops to include in maintenance manuals. Include product data for care products used or recommended by Installer and names, addresses, and telephone numbers of local sources for products.

1.5 QUALITY ASSURANCE

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

1.6 MOCKUPS

- A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for fabrication and execution.
 - 1. Build mockup of typical countertop as indicated on Drawings.
 - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver countertops only after casework and supports on which they will be installed have been completed in installation areas.
- B. Store countertops in areas where environmental conditions comply with requirements specified in "Field Conditions" Article.
- C. Keep surfaces of countertops covered with protective covering during handling and installation.

1.8 FIELD CONDITIONS

- A. Field Measurements: Where countertops are indicated to fit to other construction, verify dimensions of countertops by field measurements[after base cabinets are installed but] before countertop fabrication is complete and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work..

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Quality Standard: Unless otherwise indicated, comply with [ANSI/AWI 1236][NAAWS] for grades of simulated stone countertops indicated for construction, finishes, installation, and other requirements.
 - 1. Provide inspections of fabrication and installation together with labels and certificates from [AWI][WI] certification program indicating that countertops comply with requirements of grade specified.
 - 2. The Contract Documents contain more stringent requirements than that of the referenced quality standard. Comply with requirements of the Contract Documents in addition to those of referenced quality standard.

2.2 SOLID SURFACE MATERIAL COUNTERTOPS

- A. Solid Surface Countertop Type :
 - 1. Grade: [Premium][Custom][Economy][Match related casework].
- B. Solid Surface Material: Homogeneous fabrication of mineral fillers and pigments bound together with a matrix of polymers and resins, complying with ISFA 2-01.
 - 1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Affinity Surfaces; a brand of Domain Industries, Inc.]
 - b. [Avonite Surfaces; a Brand of Aristech Surfaces LLC]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [Durasein Solid Surface; a brand of Relang International, LLC]
 - e. [Formica Corporation]
 - f. [LG Hausys, Ltd.]
 - g. [Lotte Chemical Co., LTD]
 - h. [Meganite Inc.]
 - i. [Swan Surfaces LLC (Swanstone)]
 - j. [Transolid]
 - k. [Wilsonart LLC]
 - l. <Insert manufacturer's name>
 - 2. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
 - 3. Countertop:
 - a. Type: [Standard][Special Purpose][Veneer].
 - b. Thickness:

- 1) [1/2-inch-][3/4-inch-] thick, solid surface material[with front edge built up with same material].
 - c. Exposed Edge Treatment: [Bevel][Ogee][Radius][As selected by Architect from manufacturer's full range]<Insert style>.
 - d. Provide drip groove [1/8 inch by 1/8 inch set back 3/8 inch]<Insert groove size and location> from front edge of countertop.
 - e. Backsplash: [Integral coved][Detached straight].
 - 1) Height: [4 inches]<Insert height>.
 - 2) Thickness: [1/2 inch][Matching countertop].
 - f. End Splash: [Matching backsplash][None].
4. Sink Bowls:
- a. [Integral][Top Mounted][Separate unit for under-counter mounting].
 - b. Material: [PMMA][Acrylic][Composite][Enameled cast iron][Enameled steel][Solid surface][Stainless steel][Vitreous china]<Insert type>.
 - c. Shape: [Oval][Rectangle]<Insert type>.
 - d. Color: [White][Match countertop]<Insert color>.

2.3 QUARTZ AGGLOMERATE COUNTERTOPS

A. Quartz Agglomerate Countertop Type :

1. Grade: [Premium][Custom][Economy][Match related casework].

B. Quartz Agglomerate Material: Homogenous fabrication of natural quartz aggregates and pigments bound together with a matrix of polymers and resins, complying with ISFA 3-01.

1. Manufacturers: Subject to compliance with requirements, [provide products by the following][provide products by one of the following][available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. [Cambria]
 - b. [Cosentino North America; C&C North America, Inc.]
 - c. [DuPont; DuPont de Nemours, Inc.]
 - d. [Durasein Solid Surface; a brand of Relang International, LLC]
 - e. [Lotte Chemical Co., LTD]
 - f. [TechniStone; Wilsonart LLC]
 - g. [Vicostone USA]
 - h. [Wilsonart LLC]
 - i. <Insert manufacturer's name>
2. Colors and Patterns: [As indicated by manufacturer's designations][Match Architect's samples][As selected by Architect from manufacturer's full range].
3. Countertop:

- a. Thickness: [0.787 inch][1.18 inch].
 - b. Exposed Edge Treatment: [Chamfer][Eased][Bullnose][As selected by Architect from manufacturer's full range]<Insert style>.
 - c. Provide drip groove [1/8 inch by 1/8 inch set back 3/8 inch]<Insert groove size and location> from front edge of countertop.
 - d. Backsplash: [Integral coved][Detached straight].
 - 1) Height: [4 inches]<Insert height>.
 - e. End Splash: [Matching backsplash][None].
4. Sink Bowls:
- a. [Integral][Top mounted][Separate unit for under-counter mounting].
 - b. Material: [PMMA][Acrylic][Composite][Enameled cast iron][Enameled steel][Solid surface][Stainless steel][Vitreous china]<Insert type>.
 - c. Shape: [Oval][Rectangle]<Insert type>.
 - d. Color: [White][Match countertop]<Insert color>.

2.4 FABRICATION

- A. Fabricate countertops in sizes and shapes required to comply with requirements indicated.
- B. Fabricate tops with shop-applied edges[and backsplashes] unless otherwise indicated. Comply with solid surface material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
- 1. Fabricate with loose backsplashes for field assembly.
 - 2. Install integral sink bowls in countertops in the shop.
- C. Joints:
- 1. Fabricate countertops without joints.
 - 2. Fabricate countertops in sections for joining in field[, with joints at locations indicated].
 - a. Joint Locations: Not within 18 inches of a sink or cooktop and not where a countertop section less than 36 inches long would result, unless unavoidable.
 - b. Splined Joints: Accurately cut kerfs in edges at joints for insertion of metal splines to maintain alignment of surfaces at joints[where indicated]. Make width of cuts slightly more than thickness of splines to provide snug fit.[Provide at least three splines in each joint.]
- D. Cutouts and Holes:
- 1. Undercounter Plumbing Fixtures: Make cutouts for fixtures[in shop] using template or pattern furnished by fixture manufacturer. Form cutouts to smooth, even curves.

- a. Provide vertical edges, slightly eased at juncture of cutout edges with top and bottom surfaces of countertop and projecting 3/16 inch into fixture opening.
 - b. Provide vertical edges, rounded to 3/8-inch radius at juncture of cutout edges with top surface of countertop, slightly eased at bottom, and projecting 3/16 inch into fixture opening.
 - c. Provide 3/4-inch full bullnose edges projecting 3/8 inch into fixture opening.
2. Counter-Mounted Plumbing Fixtures: Prepare countertops in shop for field cutting openings for counter-mounted fixtures. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.
3. Fittings: Drill countertops in shop for grommets, plumbing fittings, undercounter soap dispensers, and similar items.
4. Counter-Mounted Cooktops: Prepare countertops in shop for field cutting openings for cooktops. Mark tops for cutouts and drill holes at corners of cutout locations. Make corner holes of largest radius practical.

2.5 INSTALLATION MATERIALS

- A. Particleboard: ANSI A208.1, [Grade M-2][Grade M-2-Exterior Glue].
- B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
- C. Adhesive: Product recommended by manufacturer.
- D. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to receive countertops and conditions under which countertops will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of countertops.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Before installation, condition countertops to average prevailing humidity conditions in installation areas.
- B. Examine shop-fabricated work for completion and complete work as required, including removal of packing.

3.3 INSTALLATION OF SIMULATED STONE COUNTERTOPS

- A. Grade: Install countertops to comply with specified grade.
- B. Assemble countertops and complete fabrication at Project site to the extent that it was not completed in the shop.
 - 1. Provide cutouts not finished in the shop. Make cutouts to accurately fit items to be installed, and at right angles to finished surfaces unless beveling is required for clearance. Ease edges slightly to prevent snipping.
- C. Countertop Installation:
 - 1. Scribe and cut countertops to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
 - 2. Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.
 - 3. Anchor wall cleating necessary for proper setting for countertops not supported by casework.
 - 4. Install countertops level to a tolerance of 1/8 inch in 8 ft., 1/4 inch maximum. Do not exceed 1/64-inch difference between planes of adjacent units.
 - 5. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Predrill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 6. Fasten subtops to cabinets by screwing through subtops into cornerblocks of base cabinets. Shim as needed to align subtops in a level plane.
 - 7. Secure countertops to subtops with adhesive according to manufacturer's written instructions. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with quartz agglomerate manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
 - 8. Bond joints with adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to joints to prevent adhesive smears.
 - a. Install metal splines in kerfs in countertop edges at joints[where indicated]. Fill kerfs with adhesive before inserting splines and remove excess immediately after adjoining units are drawn into position.
 - b. Clamp units to temporary bracing, supports, or each other to ensure that countertops are properly aligned and joints are of specified width.
 - 9. Install backsplashes and end splashes by adhering to wall and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears.
 - 10. Install aprons to backing and countertops with adhesive. Mask areas of countertops and splashes adjacent to joints to prevent adhesive smears. Fasten by screwing through backing. Predrill holes for screws as recommended by manufacturer.
 - 11. Seal joints between countertop and backsplash, if any, and joints where

countertop and backsplash abut walls. Comply with Section 079200 "Joint Sealants."

3.4 ADJUSTING AND CLEANING

- A. Repair damaged and defective countertops, where possible, to eliminate functional and visual defects. Where not possible to repair, replace countertops. Adjust joinery for uniform appearance.
- B. Clean countertops on exposed and semi-exposed surfaces.
- C. Protection: Provide Kraft paper or other suitable covering over countertop surfaces, taped to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

END OF SECTION 12 36 61

SECTION 129300 - SITE FURNISHINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Wood Seats (on Seat Walls)
 - 2. Litter Receptacles
 - 3. Bike Racks
 - 4. Flagpoles
 - 5. Book Drop Box (purchased by Owner, installed by Contractor)

- B. Related Requirements include the following (names and numbers may vary):

- 1. Division 01 Section "Summary"
 - 2. Division 01 Section "Alternates"
 - 3. Division 01 Section "Submittal Procedures"
 - 4. Division 01 Section "Substitutions"
 - 5. Division 03 Section "Site Cast-in-Place Concrete" for concrete for footings.
 - 6. Division 31 Section "Earth Moving" for excavation for compaction of subgrade and aggregate subbase.
 - 7. Division 32 Section "Concrete Paving and Curbs" for concrete pads and aggregate subbase material.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product, including hardware, finishes and warranties.

- 1. Verify compatibility of each flashing pedestrian sign component prior to providing product data for flashing pedestrian signs, to ensure compatibility.
 - 2. Verify compatibility of each moveable sign component prior to providing product data for moveable signs, to ensure compatibility.

- B. Shop Drawings as follows:

- 1. Show fabrication and installation details, including plans, elevations, sections, and details of fabrications connections and mounting; show anchorage and accessory items; provide shop drawings for the following:
 - a. Wood seats, including mounting, slat spacing, and armrests; include to-scale plan views of each configuration and curvature.

- C. Product Schedule: For site furnishings and flagpoles. Use same designations indicated on drawings.
- D. Engineered Flagpole Drawings, indicating conformance with applicable codes, regulations and best practices; signed and sealed by professional civil engineer registered in Pennsylvania.

1.4 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings and flagpoles, to include in maintenance manuals and warranty information.

1.5 DEMONSTRATION

- A. Demonstrate flagpole operation to Owner's Representative and Owner's staff.

1.6 DEFINITIONS

- A. Owner: Montgomery County, PA.
- B. Owner's Representative: Project Manager or Project Management Company employed by the Owner. The Owner may delegate specific Owner's Representative responsibilities to the Architect, Landscape Architect and Engineer.

PART 2 - PRODUCTS

2.1 WOOD SEATS (on Seat Walls)

- A. Product: as indicated or equal.
- B. Wood Type and Finish: as indicated, or if not indicated, manufacturer's standard option(s) for rot-resistant exterior use, as selected by Landscape Architect.
- C. Side Arms and Central Arms: as indicated, or if not indicated, manufacturer's standard option(s) as selected by Landscape Architect.
- D. Length: varies, as indicated.
- E. Radius: as indicated for seats on the walk curve.

2.2 LITTER /RECYCLING RECEPTACLES

- A. Product as follows, select one of the following:
 - 1. Midtown Dual Recycle/Litter Receptacle with Doors, by Keystone Ridge – MT3D-32DRT – 55 5/16" long x 31 1/8" wide, 37 1/2" high, with rain lid over litter area, adjustable leg, labels.

2. Windsor Trash and Recycling Receptacle by Thomas Steele, with receptacle doors, elevated dome lid, 32 gal; with labels for recycling and litter as approved by Landscape Architect.
3. Or custom "Double Cassidy" with Rain Bonnet Lids and swinging/latching doors as manufactured/supplied by Barco Products – customized with two doors as approved equal to the Keystone Ridge or Thomas Steele products indicated above).

- B. Quantity: two – location(s) as indicated, or if not indicated, as selected by Landscape Architect.
- C. Primary Material: Steel.
- D. Finish: polyester powder coat, gloss, on properly prepared surface.
 1. Color as selected by Landscape Architect from manufacturer's standard colors.

2.3 BIKE RACKS

- A. Product: custom BookWorm bike rack by Parkitect, or approved equal from a custom fabrication shop to match.
 1. Two sizes as indicated – one standard, one custom.
- B. Finish: powder coat, gloss, on properly prepared surface.
 1. Color: standard color from manufacturer's full range, as selected by Landscape Architect.
- C. Location: as indicated on Drawings, or if not indicated, as selected by Landscape Architect.
- D. Quantity: As indicated.
- E. Accessories: "book" on metal stand, pipe color to match BookWorm pipe color; use manufacturer's standard color(s) for the book.

2.4 FLAGPOLES

- A. Aluminum: clear anodized finish or brushed satin finish as selected by Landscape Architect.
- B. Heights: as indicated on drawings.
- C. Halyard: internal, with tamperproof locking access box matching pole finish.
 1. Provide a minimum of three sets of keys to Owner.
- D. Truck: revolving truck.
- E. Winch: Wire Halyard with a gearless Winch and Winch Handle.
- F. Finial, round gold anodized aluminum.
- G. Footing: concrete footing hidden under base cover.
- H. Base cover: 1/4" thick heavy-duty cast aluminum.
- I. Manufacturer: one of the following (must meet specifications herein):
 1. Concord American Flagpole, or approved equal
- J. Uplighting – as indicated by electrical engineer / lighting designer.
- K. Flag: 3-foot x 5-foot, NOT IN CONTRACT

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated; free of surface blemishes and complying with the following:

1. Rolled or cold-finished bars, rods, and wire: ASTM B 211.
 2. Extruded Bars, Rods, wire, profiles, and tubes: ASTM B 221.
 3. Structural pipe and tube: ASTM B 429/B 429M.
 4. Castings: ASTM B 26/B 26M.
- B. Steel and Iron: Free of surface blemishes and complying with the following:
1. Plates, shapes, and bars: ASTM A 36/A 36M.
 2. Steel Pipe: Standard-weight steel pipe complying with ASTM A 53/A 53M, or electric-resistance-welded pipe complying with ASTM A 135/A 135M.
 3. Tubing: Cold-formed steel tubing complying with ASTM A 500/A 500M.
 4. Mechanical Tubing: Cold-rolled, electric-resistance-welded carbon or alloy steel tubing complying with ASTM A 513, or steel tubing fabricated from steel complying with ASTM A 1011/A 1011M and complying with dimensional tolerances in ASTM A 500/A 500M; zinc coated internally and externally.
 5. Sheet: Commercial steel sheet complying with ASTM A 1011/A 1011M.
- C. Stainless Steel: Free of surface blemishes and complying with the following:
1. Sheet, strip, plate, and flat bars: ASTM A 666.
- D. Fiberglass: Multiple laminations of glass-fiber-reinforced polyester resin with UV-light stable, colorfast, nonfading, weather- and stain-resistant, colored polyester gel coat, and with manufacturer's standard finish.
- E. Plastic: Color impregnated, color and UV-light stabilized, and mold resistant.
1. Polyethylene: Fabricated from virgin plastic HDPE resin.
- F. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard or recommended, corrosion-resistant-coated or noncorrodible materials; commercial quality; tamperproof (stainless steel if available for the application).
1. For anchors utilize Powers Spike pre-expanded tamperproof anchors, mushroom head, 316 stainless steel, or approved equal – unless not feasible for the application.
- G. Concrete: Comply with requirements in Section 033001 "Site Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.
- H. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M; recommended in writing by manufacturer, for exterior applications.
- I. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound; resistant to erosion from water exposure without needing protection by a sealer or waterproof coating; recommended in writing by manufacturer, for exterior applications.

- J. Galvanizing: Where indicated for steel and iron components, provide the following protective zinc coating applied to components after fabrication:
1. Zinc-Coated Tubing: External, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, polymer film. Internal, same as external or consisting of 81 percent zinc pigmented coating, not less than 0.3 mil thick.
 2. Hot-Dip Galvanizing: According to ASTM A 123/A 123M, ASTM A 153/A 153M, or ASTM A 924/A 924M; use instead of zinc-coating if available and applicable to the product type.

2.6 FABRICATION

- A. Metal Components: Form to required shapes and sizes with true, consistent curves, lines, and angles. Separate metals from dissimilar materials to prevent electrolytic action.
- B. Welded Connections: Weld connections continuously. Weld solid members with full-length, full-penetration welds and hollow members with full-circumference welds. At exposed connections, finish surfaces smooth and blended so no roughness or unevenness shows after finishing and welded surface matches contours of adjoining surfaces.
- C. Pipes and Tubes: 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.
- D. Exposed Surfaces: Polished, sanded, or otherwise finished; all surfaces smooth, free of burrs, barbs, splinters, and sharpness; all edges and ends rolled, rounded, or capped.
- E. Factory Assembly: Assemble components in the factory to greatest extent possible to minimize field assembly. Clearly mark units for assembly in the field.

2.7 GENERAL FINISH REQUIREMENTS

- A. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES – SITE FURNISHINGS

- A. Flagpoles: as described herein.
- B. Wood Bench arms/accessories, Litter Receptacles, and Bike Racks: Baked-Enamel, Powder-Coat Finish: manufacturer's standard color palette, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.9 STEEL AND GALVANIZED-STEEL FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard color palette, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.10 IRON FINISHES

- A. Baked-Enamel, Powder-Coat Finish: Manufacturer's standard color palette, baked, polyester, powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness.

2.11 STAINLESS-STEEL FINISHES

- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
- B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated or described herein. Complete field assembly of components where required.
- B. Unless otherwise indicated, install site furnishings that are mounted on concrete pads after landscaping and paving have been completed except as described below.
 - 1. For site furnishings mounted on pavers that are over concrete sub-base, coordinate with paver installer; extend anchor bolts down to concrete sub-base.
 - 2. For site furnishings mounted on pavers on aggregate, coordinate with paver installer; provide concrete footing under the paving and extend anchor bolts down to the concrete footing.
- C. Install items level, plumb, true, and securely anchored at locations indicated on Drawings.
 - 1. Mark locations on site for review by Landscape Architect prior to installation.
 - 2. Orient signs and site furnishings per review of Landscape Architect prior to final mounting.

3. Avoid putting base plates and anchor bolts over concrete joints; review any issues with the Landscape Architect prior to installation.
- D. Anchor Bolt Setting: Core-drill holes for installing anchor bolts in concrete. Clean holes of loose material.
 1. Wherever feasible use mushroom head PowersPike 316 stainless steel pre-expanded anchors or equal; follow manufacturer's written instructions.
 2. Where inserting posts and anchors (other than PowersPike) in concrete footings, fill annular space between bolt and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
 3. Do not crack concrete pads.
 - a. If damaged, replace pads up to next isolation joint that are damaged, or as otherwise approved by Landscape Architect.
- E. Hardware: Utilize tamperproof hardware. If not available, then make the hardware tamperproof. Cut off threaded bolts protruding more than one-half inch and grind ends smooth after item and hardware is installed.
 1. Utilize rust-proof hardware: use 316 stainless steel if available, or if not available then 304 stainless steel, or if not available then use the best galvanized type or rustproof type available from the manufacturer. Do not use adjacent metal types that cause galvanic corrosion.

3.3 WOOD SEAT INSTALLATION

- A. Review concrete wall lengths and confirm wood seat fabrication is compatible; correct any incompatibilities.
- B. Align wood seats in center of concrete walls.
- C. Install wood seats with anchor bolts.
- D. Install armrests in approved locations.

3.4 LITTER & RECYCLING RECEPTACLE INSTALLATION

- A. See Drawings for alignment.
- B. Stake out location for review by Landscape Architect.

- C. At west plaza at location indicated, install concrete pad of adequate size to work with selected Receptacle.
- D. Second location is indicated in the paver zone at the lower entry: provide concrete underslab as indicated, under the pavers.
- E. Anchor to concrete, minimum 3" embedment.
- F. At paver areas, cut pavers around anchor bolts with maximum 1/4" gap.

3.5 BIKE RACK INSTALLATION

- G. See Drawings for alignment and distance between bike racks; coordinate trades including coordinating clearance requirement of other items such as book box, building, and walkways.
- H. Stake out location and components for review by Landscape Architect. Adjust as requested including size and location of concrete pad.
- I. Install concrete pad (or concrete underslab if indicated), and install concrete walk (or pavers if indicated).
- J. Install plumb, anchoring to concrete.
- K. At paver areas, cut pavers around anchor bolts with maximum 1/4" gap.

3.6 FLAPOLE INSTALLATION

- A. Stake out locations for approval prior to installing walls; include wall stakeout, wall joint stakeout and trellis stakeout for review.
 - 1. Align flagpoles with centers of trellis panels, halfway between wall joints, and per field layout review by Landscape Architect.
- B. Coordinate installation with walk, wall and trellis installation.
- C. Install footing to meet and match the adjacent concrete sidewalk.
 - 1. Provide isolation joint between footing and sidewalk
- D. Install flagpole, flagpole base cover, and components.
- E. Protect from damage of installation of adjacent items such as wall finishing and trellis.

3.7 BOOK DROP BOX INSTALLATION

- A. Coordination with Owner as indicated, to determine final concrete pad size.
- B. Stake out location and components for review by Landscape Architect and Owner. Adjust as requested including size and location of concrete pad.
- C. Install concrete pad.

- D. Install plumb, anchoring to concrete.
- 3.8 Protect site furnishings while other construction is ongoing; remove protections after adjacent work is complete.
- 3.9 Dispose of excess and waste materials legally offsite.

END OF SECTION

SECTION 14 24 00 - MACHINE ROOM-LESS HYDRAULIC PASSENGER ELEVATORS**PART 1 GENERAL****1.01 SUMMARY 1 Duplex (2- 3500 Capacity) (1- Simplex 3000 Capacity)**

- A. Section includes: Machine room-less hydraulic passenger elevators as shown and specified.
Elevator work includes:

1. Standard pre-engineered hydraulic passenger elevators.
2. Elevator car enclosures, hoistway entrances and signal equipment.
3. Operation and control systems.
4. Jack(s).
5. Accessibility provisions for physically disabled persons.
6. Equipment, machines, controls, systems and devices as required for safely operating the specified elevators at their rated speed and capacity.
7. Materials and accessories as required to complete the elevator installation.

B. Related Sections:

1. Division 1 General Requirements: Meet or exceed all referenced sustainability requirements.
2. Division 3 Concrete: Installing inserts, sleeves and anchors in concrete.
3. Division 4 Masonry: Installing inserts, sleeves and anchors in masonry.
4. Division 5 Metals:
 - a. Providing hoist beams, pit ladders, steel framing, auxiliary support steel and divider beams for supporting guide-rail brackets.
 - b. Providing steel angle sill supports and grouting hoistway entrance sills and frames.
5. Division 9 Finishes: Providing elevator car finish flooring and field painting unfinished and shop primed ferrous materials.
6. Division 16 Sections:
 - a. Providing electrical service to elevators, including fused disconnect switches where permitted. (note: fused disconnect switch to be provided as part of elevator manufacture product, see section 2.11 Miscellaneous elevator components for further details.)
 - b. Emergency power supply, transfer switch and auxiliary contacts.
 - c. Heat and smoke sensing devices.
 - d. Convenience outlets and illumination in control room (if applicable), hoistway and pit.
7. Division 22 Plumbing
 - a. Sump pit and oil interceptor.
8. Division 23 Heating, Ventilation and Air Conditioning
 - a. Heating and ventilating hoistways and/or control room.

- C. Work Not Included: General contractor shall provide the following in accordance with the requirements of the Model Building Code and ANSI A17.1 Code. For specific rules, refer to ANSI A17.1, Part 3 for hydraulic elevators. State or local requirements must be used if more stringent. The cost of this work is not included in the TK Elevator's proposal, since it is a part of the building construction.

1. Elevator hoist beam to be provided at top of elevator shaft. Beam must be able to accommodate proper loads and clearances for elevator installation and operation.

2. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports and bracing including all setting templates and diagrams for placement.
3. Hatch walls require a minimum two hours of fire rating. Hoistway should be clear and plumb with variations not to exceed 1/2" at any point.
4. Elevator hoistways shall have barricades, as required.
5. Install bevel guards at 75° on all recesses, projections or setbacks over 2" (4" for A17.1 2000 areas) except for loading or unloading.
6. Provide rail bracket supports at pit, each floor and roof. For guide rail bracket supports, provide divider beams between hoistway at each floor and roof.
7. Pit floor shall be level and free of debris. Reinforce dry pit to sustain normal vertical forces from rails and buffers.
8. Where pit access is by means of the lowest hoistway entrance, a vertical ladder of non-combustible material extending 42" minimum, (48" minimum for A17.1-2000 areas) shall be provided at the same height, above sill of access door or handgrips.
9. All wire and conduit should run remote from the hoistways.
10. When heat, smoke or combustion sensing devices are required, connect to elevator control cabinet terminals. Contacts on the sensors should be sided for 12 volt D.C.
11. Install and furnish finished flooring in elevator cab.
12. Finished floors and entrance walls are not to be constructed until after sills and door frames are in place. Consult elevator contractor for rough opening size. The general contractor shall supply the drywall framing so that the wall fire resistance rating is maintained, when drywall construction is used.
13. Where sheet rock or drywall construction is used for front walls, it shall be of sufficient strength to maintain the doors in true lateral alignment. Drywall contractor to coordinate with elevator contractor.
14. Before erection of rough walls and doors; erect hoistway sills, headers, and frames. After rough walls are finished; erect fascias and toe guards. Set sill level and slightly above finished floor at landings.
15. To maintain legal fire rating (masonry construction), door frames are to be anchored to walls and properly grouted in place.
16. The elevator wall shall interface with the hoistway entrance assembly and be in strict compliance with the elevator contractor's requirements.
17. General Contractor shall fill and grout around entrances, as required.
18. All walls and sill supports must be plumb where openings occur.
19. Locate a light fixture (200 lx / 19 fc) and convenience outlet in pit with switch located adjacent to the access door.
20. Provide telephone line, light fixture (200 lx / 19 fc), and convenience outlet in the hoistway at the landing where the elevator controller is located. Typically this will be at the landing above the 1st floor. Final location must be coordinated with elevator contractor.
21. As indicated by elevator contractor, provide a light outlet for each elevator, in center of hoistway.
22. For signal systems and power operated door: provide ground and branch wiring circuits.
23. For car light and fan: provide a feeder and branch wiring circuits to elevator control cabinet.

24. Controller landing wall thickness must be a minimum of 8 1/2 inches thick. This is due to the controller being mounted on the second floor landing in the door frame on the return side of the door. For center opening doors, the controller is located on the right hand frame (from inside the elevator cab looking out). These requirements must be coordinated between the general contractor and the elevator contractor.
25. Cutting, patching and recesses to accommodate hall button boxes, signal fixtures, etc..

1.02 SUBMITTALS

- A. Product data: When requested, the elevator contractor shall provide standard cab, entrance and signal fixture data to describe product for approval.
- B. Shop drawings:
 1. Show equipment arrangement in the corridor, pit, and hoistway and/or optional control room. Provide plans, elevations, sections and details of assembly, erection, anchorage, and equipment location.
 2. Indicate elevator system capacities, sizes, performances, safety features, finishes and other pertinent information.
 3. Show floors served, travel distances, maximum loads imposed on the building structure at points of support and all similar considerations of the elevator work.
 4. Indicate electrical power requirements and branch circuit protection device recommendations.
- C. Powder Coat paint selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- D. Plastic laminate selection: Submit manufacturer's standard selection charts for exposed finishes and materials.
- E. Metal Finishes: Upon request, standard metal samples provided.
- F. Operation and maintenance data. Include the following:
 1. Owner's manuals and wiring diagrams.
 2. Parts list, with recommended parts inventory.

1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: An approved manufacturer with minimum 15 years of experience in manufacturing, installing, and servicing elevators of the type required for the project.
 1. The manufacturer of machines, controllers, signal fixtures, door operators cabs, entrances, and all other major parts of elevator operating equipment.
 - a. The major parts of the elevator equipment shall be manufactured by the installing company, and not be an assembled system.
 2. The manufacturer shall have a documented, on-going quality assurance program.
 3. ISO-9001:2000 Manufacturer Certified
 4. ISO-14001:2004 Environmental Management System Certified
 5. LEED Gold certified elevator manufacturing facility.

- B. Installer Qualifications: The manufacturer or an authorized agent of the manufacturer with not less than 15 years of satisfactory experience installing elevators equal in character and performance to the project elevators.
- C. Regulatory Requirements:
 - 1. ASME A17.1 Safety Code for Elevators and Escalators, latest edition or as required by the local building code.
 - 2. Building Code: National.
 - 3. NFPA 70 National Electrical Code.
 - 4. NFPA 80 Fire Doors and Windows.
 - 5. Americans with Disabilities Act - Accessibility Guidelines (ADAAG)
 - 6. Section 407 in ICC A117.1, when required by local authorities
 - 7. CAN/CSA C22.1 Canadian Electrical Code
 - 8. CAN/CSA B44 Safety Code for Elevators and Escalators.
 - 9. California Department of Public Health Standard Method V1.1–2010, CA Section 01350
- D. Fire-rated entrance assemblies: Opening protective assemblies including frames, hardware, and operation shall comply with ASTM E2074, CAN4-S104 (ULC-S104), UL10(b), and NFPA Standard 80. Provide entrance assembly units bearing Class B or 1 1/2 hour label by a Nationally Recognized Testing Laboratory (2 hour label in Canada).
- E. Inspection and testing:
 - 1. Elevator Installer shall obtain and pay for all required inspections, tests, permits and fees for elevator installation.
 - 2. Arrange for inspections and make required tests.
 - 3. Deliver to the Owner upon completion and acceptance of elevator work.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Manufacturing shall deliver elevator materials, components and equipment and the contractor is responsible to provide secure and safe storage on job site.

1.05 PROJECT CONDITIONS

- A. Temporary Use: Elevators shall not be used for temporary service or for any other purpose during the construction period before Substantial Completion and acceptance by the purchaser unless agreed upon by Elevator Contractor and General Contractor with signed temporary agreement.

1.06 WARRANTY

- A. Warranty: Submit elevator manufacturer's standard written warranty agreeing to repair, restore or replace defects in elevator work materials and workmanship not due to ordinary wear and tear or improper use or care for 12 months after final acceptance.

1.07 MAINTENANCE

- A. Furnish maintenance and call back service for a period of 12 months for each elevator after completion of installation or acceptance thereof by beneficial use, whichever is earlier, during normal working hours excluding callbacks.
 - 1. Service shall consist of periodic examination of the equipment, adjustment, lubrication, cleaning, supplies and parts to keep the elevators in proper operation. Maintenance work, including emergency call back repair service, shall be performed by trained employees of the elevator contractor during regular working hours.
 - 2. Submit parts catalog and show evidence of local parts inventory with complete list of recommended spare parts. Parts shall be produced by manufacturer of original equipment.
 - 3. Manufacturer shall have a service office and full time service personnel within a 100 mile radius of the project site.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturer: Design based around TK Elevator's endura Machine Room-Less hydraulic elevator, OR EQUAL

2.02 MATERIALS, GENERAL

- A. All Elevator Cab materials including frame, buttons, lighting, wall and ceiling assembly, laminates and carpet shall have an EPD and an HPD, and shall meet the California Department of Public Health Standard Method V1.1–2010, CA Section 01350 as mentioned in 1.03.9 of this specification.
- B. Colors, patterns, and finishes: As selected by the Architect from manufacturer's full range of standard colors, patterns, and finishes.
- C. Steel:
 - 1. Shapes and bars: Carbon.
 - 2. Sheet: Cold-rolled steel sheet, commercial quality, Class 1, matte finish.
 - 3. Finish: Factory-applied baked enamel for structural parts, powder coat for architectural parts. Color selection must be based on elevator manufacture's standard selections.
- D. Plastic laminate: Decorative high-pressure type, complying with NEMA LD3, Type GP-50 General Purpose Grade, nominal 0.050" thickness. Laminate selection must be based on elevator manufacture's standard selections.
- E. Flooring by others, provide CT-2 see finish plan.

2.03 HOISTWAY EQUIPMENT

- A. Platform: Fabricated frame of formed or structural steel shapes, gusseted and rigidly welded with a wood sub-floor. Underside of the platform shall be fireproofed. The car

platform shall be designed and fabricated to support one-piece loads weighing up to 25% of the rated capacity.

- B. Sling: Steel stiles bolted or welded to a steel crosshead and bolstered with bracing members to remove strain from the car enclosure.
- C. Guide Rails: Steel, omega shaped, fastened to the building structure with steel brackets.
- D. Guides: Slide guides shall be mounted on top and bottom of the car.
- E. Buffers: Provide substantial buffers in the elevator pit. Mount buffers on continuous channels fastened to the elevator guide rail or securely anchored to the pit floor. Provide extensions if required by project conditions.
- F. Jack: A jack unit shall be of sufficient size to lift the gross load the height specified. Factory test jack to ensure adequate strength and freedom from leakage. Brittle material, such as gray cast iron, is prohibited in the jack construction. Provide the following jack type: Twin post holeless telesic 3-stage. Two jacks piped together, mounted one on each side of the car with each having three telesic sections designed to extend in a synchronized manner when oil is pumped into the Assembly. Each jack section will be guided from within the casing or the plunger assembly used to house the section. Each plunger shall have a high pressure sealing system which will not allow for seal movement or displacement during the course of operation. A follower guide shall be furnished for the top of the lower two plungers and be guided by rollers running inside a steel guide channel which is firmly attached to the guide rail system. This plunger guide system shall maintain a stabilized support for the plunger sections. Each Jack Assembly shall have check valves built into the assembly to allow for automatically re-synching the three plunger sections by moving the jack to its fully contracted position..
- G. Automatic Self-Leveling: Provide each elevator car with a self-leveling feature to automatically bring the car to the floor landings and correct for over travel or under travel. Self-leveling shall, within its zone, be automatic and independent of the operating device. The car shall be maintained approximately level with the landing irrespective of its load.
- H. Wiring, Piping, and Oil: Provide all necessary hoistway wiring in accordance with the National Electrical Code. All necessary code compliant pipe and fittings shall be provided to connect the power unit to the jack unit. Provide proper viscosity grade inherently biodegradable oil as specified by the manufacturer of the power unit (see Power Unit section 2.04.G for further details)
- I. Pit moisture/water sensor located approximately 1 foot above the pit floor to be provided. Once activated, elevator will perform "flooded pit operation", which will run the car up to the designated floor, cycle the doors and shut down and trip the circuit breaker shunt to remove 3 phase power from all equipment, including pit equipment.

- J. Motorized oil line shut-off valve shall be provided that can be remotely operated from the controller landing service panel. Also a means for manual operation at the valve in the pit is required.

2.04 POWER UNIT

- A. Power Unit (Oil Pumping and Control Mechanism): A self-contained unit located in the elevator pit consisting of the following items:
1. NEMA 4/Sealed Oil reservoir with tank cover including vapor removing tank breather
 2. An oil hydraulic pump.
 3. An electric motor.
 4. Electronic oil control valve with the following components built into single housing; high pressure relief valve, check valve, automatic unloading up start valve, lowering and leveling valve, and electro-magnetic controlling solenoids.
- B. Pump: Positive displacement type pump specifically manufactured for oil-hydraulic elevator service. Pump shall be designed for steady discharge with minimum pulsation to give smooth and quiet operation. Output of pump shall not vary more than 10 percent between no load and full load on the elevator car.
- C. Motor: Standard manufacture motor specifically designed for oil-hydraulic elevator service. Duty rating – motors shall be capable of 80 starts per hour with a 30% motor run time during each start.
- D. Oil Control Unit: The following components shall be built into a single housing. Welded manifolds with separate valves to accomplish each function are not acceptable. Adjustments shall be accessible and be made without removing the assembly from the oil line.
1. Relief valve shall be adjustable and be capable of bypassing the total oil flow without increasing back pressure more than 10 percent above that required to barely open the valve.
 2. Up start and stop valve shall be adjustable and designed to bypass oil flow during start and stop of motor pump assembly. Valve shall close slowly, gradually diverting oil to or from the jack unit, ensuring smooth up starts and up stops.
 3. Check valve shall be designed to close quietly without permitting any perceptible reverse flow.
 4. Lowering valve and leveling valve shall be adjustable for down start speed, lowering speed, leveling speed and stopping speed to ensure smooth "down" starts and stops. The leveling valve shall be designed to level the car to the floor in the direction the car is traveling after slowdown is initiated.
 5. Provided with constant speed regulation in both up and down direction. Feature to compensate for load changes, oil temperature, and viscosity changes.
 6. Solid State Starting: Provide an electronic starter featuring adjustable starting currents.
 7. A secondary hydraulic power source (powered by 110VAC single phase) must be provided. This is required to be able to raise (reposition) the elevator in the event of a system component failure (i.e. pump motor, starter, etc.)

8. Oil Type: Provide a zinc free, inherently biodegradable lubricant formulated with premium base stocks to provide outstanding protection for demanding hydraulic systems, especially those operating in environmentally sensitive areas.

2.05 HOISTWAY ENTRANCES

- A. Doors and Frames: Provide complete hollow metal type hoistway entrances at each hoistway opening bolted\knock down construction.
 1. Manufacturer's standard entrance design consisting of hangers, doors, hanger supports, hanger covers, fascia plates (where required), sight guards, and necessary hardware.
 2. Main landing door & frame finish: ASTM A1008 steel panels, factory applied powder coat finish with factory-applied powder coat finish entrance frame.
 3. Typical door & frame finish: ASTM A366 steel panels, factory applied powder coat enamel finish with factory-applied powder coat finish entrance frame.
- B. Integrated Control System: the elevator controller to be mounted to hoistway entrance above 1st landing. The entrance at this level, shall be designed to accommodate the control system and provide a means of access to critical electrical components and troubleshooting features. See section 2.09 Control System for additional requirements.
- C. At the controller landing, the hoistway entrance frame shall have space to accommodate and provide a lockable means of access (group 2 security) to a 3 phase circuit breaker. See section 2.11 Miscellaneous Elevator Components for further details
- D. Interlocks: Equip each hoistway entrance with an approved type interlock tested as required by code. Provide door restriction devices as required by code.
- E. Door Hanger and Tracks: Provide sheave type two point suspension hangers and tracks for each hoistway horizontal sliding door.
 1. Sheaves: Polyurethane tires with ball bearings properly sealed to retain grease.
 2. Hangers: Provide an adjustable device beneath the track to limit the up-thrust of the doors during operation.
 3. Tracks: Drawn steel shapes, smooth surface and shaped to conform to the hanger sheaves.
- F. Hoistway Sills: Extruded metal, with groove(s) in top surface. Provide mill finish on aluminum.

2.06 PASSENGER ELEVATOR CAR ENCLOSURE

- A. Car Enclosure:
 1. Walls: Cab type TKAP, reinforced cold-rolled steel with two coats factory applied baked enamel finish, with applied vertical wood core panels covered on both sides with high pressure plastic laminate.
 2. Reveals and frieze: a. Reveals and frieze: Powder Coated
 3. Canopy: Cold-rolled steel with hinged exit.

4. Ceiling: Suspended type, LED lighting with translucent diffuser mounted in a metal frame. Framework shall be finished with a factory applied powder coat finish.
 5. Cab Fronts, Return, Transom, Soffit and Strike: Provide panels faced with brushed stainless steel
 6. Doors: Horizontal sliding car doors reinforced with steel for panel rigidity. Hang doors on sheave type hangers with polyurethane tires that roll on a polished steel track and are guided at the bottom by non-metallic sliding guides.
 - a. Door Finish: Stainless steel panels: No. 4 brushed finish.
 - b. Cab Sills: Extruded aluminum, mill finish.
 7. Handrail: Provide 1.5' diameter cylindrical metal on side and rear walls on front opening cars and side walls only on front and rear opening cars. Handrails shall have a stainless steel, no. 4 brushed finish.
 8. Ventilation: Manufacturer's standard exhaust fan, mounted on the car top.
 9. Protection pads and buttons: Not required
- B. Car Top Inspection: Provide a car top inspection station with an "Auto-Inspection" switch, an "emergency stop" switch, and constant pressure "up and down" direction and safety buttons to make the normal operating devices inoperative. The station shall give the inspector complete control of the elevator. The car top inspection station shall be mounted in the door operator assembly.

2.07 DOOR OPERATION

- A. Door Operation: Provide a direct or alternating current motor driven heavy duty operator designed to operate the car and hoistway doors simultaneously. The door control system shall be digital closed loop and the closed loop circuit shall give constant feedback on the position and velocity of the elevator door. The motor torque shall be constantly adjusted to maintain the correct door speed based on its position and load. All adjustments and setup shall be through the computer based service tool. Door movements shall follow a field programmable speed pattern with smooth acceleration and deceleration at the ends of travel. The mechanical door operating mechanism shall be arranged for manual operation in event of power failure. Doors shall automatically open when the car arrives at the landing and automatically close after an adjustable time interval or when the car is dispatched to another landing. AC controlled units with oil checks, or other deviations are not acceptable.
1. No Un-Necessary Door Operation: The car door shall open only if the car is stopping for a car or hall call, answering a car or hall call at the present position or selected as a dispatch car.
 2. Door Open Time Saver: If a car is stopping in response to a car call assignment only (no coincident hall call), the current door hold open time is changed to a shorter field programmable time when the electronic door protection device is activated.
 3. Double Door Operation: When a car stops at a landing with concurrent up and down hall calls, no car calls, and no other hall call assignments, the car door opens to answer the hall call in the direction of the car's current travel. If an onward car call is not registered before the door closes to within 6 inches of fully closed, the travel shall reverse and the door shall reopen to answer the other call.
 4. Nudging Operation: The doors shall remain open as long as the electronic detector senses the presence of a passenger or object in the door opening. If door closing is

prevented for a field programmable time, a buzzer shall sound. When the obstruction is removed, the door shall begin to close at reduced speed. If the infra-red door protection system detects a person or object while closing on nudging, the doors shall stop and resume closing only after the obstruction has been removed.

5. Door Reversal: If the doors are closing and the infra-red beam(s) is interrupted, the doors shall reverse and reopen. After the obstruction is cleared, the doors shall begin to close.
 6. Door Open Watchdog: If the doors are opening, but do not fully open after a field adjustable time, the doors shall recycle closed then attempt to open six times to try and correct the fault.
 7. Door Close Watchdog: If the doors are closing, but do not fully close after a field adjustable time, the doors shall recycle open then attempt to close six times to try and correct the fault.
 8. Door Close Assist: When the doors have failed to fully close and are in the recycle mode, the door drive motor shall have increased torque applied to possibly overcome mechanical resistance or differential air pressure and allow the door to close.
- B. Door Protection Device: Provide a door protection system using microprocessor controlled infra-red light beams. The beams shall project across the car opening detecting the presence of a passenger or object. If door movement is obstructed, the doors shall immediately reopen.

2.08 CAR OPERATING STATION

- A. Car Operating Station, General: The main car control in each car shall contain the devices required for specific operation mounted in an integral swing return panel requiring no applied faceplate. Wrap return shall have a brushed stainless steel finish. The main car operating panel shall be mounted in the return and comply with handicap requirements. Pushbuttons that illuminate using long lasting LED's shall be included for each floor served, and emergency buttons and switches shall be provided per code. Switches for car light and accessories shall be provided.
- B. Emergency Communications System: Integral phone system provided.
- C. Auxiliary Operating Panel:
- D. Column Mounted Car Riding Lantern: A car riding lantern shall be installed in the elevator cab and located in the entrance. The lantern, when illuminated, will indicate the intended direction of travel. The lantern will illuminate and a signal will sound when the car arrives at a floor where it will stop. The lantern shall remain illuminated until the door(s) begin to close.
- E. Special Equipment: Not Applicable
- F. Digital Services: Cloud-based IoT monitoring system comes standard with these options:

Remote Monitoring with Application Programming Interface (API) Integration

ADA Phone - Code Compliant Cellular Connectivity

Smart Device Elevator Calling with occupant app API integration

2.09 CONTROL SYSTEMS

- A. Controller: Shall be integrated in a hoistway entrance jamb. Should be microprocessor based, software oriented and protected from environmental extremes and excessive vibrations in a NEMA 1 enclosure. Control of the elevator shall be automatic in operation by means of push buttons in the car numbered to correspond to floors served, for registering car stops, and by "up-down" push buttons at each intermediate landing and "call" push buttons at terminal landings.
- B. Service Panel – to be located outside the hoistway in the controller entrance jamb and shall provide the following functionality/features:
 - 1. Access to main control board and CPU
 - 2. Main controller diagnostics
 - 3. Main controller fuses
 - 4. Universal Interface Tool (UIT)
 - 5. Remote valve adjustment
 - 6. Electronic motor starter adjustment and diagnostics
 - 7. Operation of pit motorized shut-off valve with LED feedback to the state of the valve in the pit
 - 8. Operation of auxiliary pump/motor (secondary hydraulic power source)
 - 9. Operation of electrical assisted manual lowering
 - 10. Provide male plug to supply 110VAC into the controller
 - 11. Run/Stop button
- C. Automatic Light and Fan shut down: The control system shall evaluate the system activity and automatically turn off the cab lighting and ventilation fan during periods of inactivity. The settings shall be field programmable.
- D. Emergency Power Operation: (10-DOA) Upon loss of the normal power supply, building-supplied standby power is available on the same wires as the normal power supply. Once the loss of normal power is detected and standby power is available, the elevator is lowered to a pre-designated landing and the doors are opened. After passengers have exited the elevator, the doors are closed and the car is shut down. When normal power is restored, the elevator automatically resumes operation.
- E. Special Operation: Not Applicable
- F. Digital Services:

Cloud-based IoT Monitoring System (standard): Contractor shall provide a cloud-based IoT (internet of things) monitoring system capable of tracking door movements and timing, trips, power cycles, car calls, out-of-service events and modes. This observation will continue 24/7 and it shall be capable of providing service technicians a minimum of three recommended solutions

for defined failure events and automatically dispatch service technicians in the event of failure(s) while sending notifications to end users of changes in their equipment's state via both email and mobile device. Access to IoT and related equipment data and status will be made available in both a web portal and mobile application secured by password and username with at least two-factor authentication. Finally, this system must be self-contained and not require internet provision by others.

Along with the monitoring system, options are available.

Remote Monitoring with Application Programming Interface (API) Integration: Contractor shall provide a portal and mobile device application (app) that communicates relevant service and operational information such as elevator operational status, open service call tickets, call ticket history and performance and service history. This system shall provide a REST application programming interface (API) capable of transmitting relevant information from the cloud-based IoT monitoring system. This data includes equipment operational status, door movements, service and maintenance history, traffic statistics and failure alerts.

ADA Phone – Code Compliant Cellular Connectivity: Contractor shall provide a phone service through a self-contained cellular based VoIP system. This system shall meet code, include a backup battery capable of powering the emergency communication equipment for 4+ hours in the event of a power outage. The solution shall have remote monitoring capability to ensure continuous connectivity with a means of remote troubleshooting. Remote monitoring capability shall include, at a minimum, the ability to monitor connectivity and power supply. Remote monitoring shall be capable of providing local alerts to response personnel when on-site intervention is required.

Smart Device Elevator Calling with Occupant app API Integration: Contractor will provide an elevator calling application for smart devices (app) that can be accessed through Android and IOS smart device operating systems. This calling service shall be accomplished on both, Destination Dispatch and Traditional ETA elevator control system applications. Furthermore, a single, common and consistent app shall have the same user experience and user interface on both Destination Dispatch and Traditional ETA dispatching control systems. To enable mobile calling functionality without creating unnecessary wear on elevator components resulting from false calls, proximity detection beacons shall be installed in the elevator lobby at each floor. These beacons shall detect user smart devices and restrict calling of elevators when the user is not within a pre-configured range of elevator entrance. Beacon-based proximity detection distance must be configurable to accommodate various building and floor layouts. Once Bluetooth signal is detected, the user can place a floor call directly from their handheld or wearable device. The elevator calling app shall remove the need for interaction with hall fixtures, buttons or kiosks. This system shall be capable of placing an automatic call to a user-configured destination floor automatically based on both location in building (floor) and time of day. App users shall be able to configure their own source or starting floor, destination floor and schedule of automatic calling service, and be able to configure multiple automatic calling services and routines. System shall have reasonable ability to auto-provision users from access control system and not require duplicate entry of users for access control purposes. Finally, all services above shall be made available via an application programming interface (API) so that a 3rd party or tenant occupant app could be integrated with elevator smart device calling service so that users could receive multiple occupant experience-based services in a

single, common, 3rd party mobile device application (app).

2.10 HALL STATIONS

- A. Hall Stations, General: Buttons shall illuminate to indicate call has been registered at that floor for the indicated direction.
 - 1. Provide one pushbutton riser with faceplates having a brushed stainless steel finish.
 - a. Phase 1 firefighter's service key switch, with instructions, shall be incorporated into the hall station at the designated level.
- B. Floor Identification Pads: Provide door jamb pads at each floor. Jamb pads shall comply with Americans with Disabilities Act (ADA) requirements.
- C. Hall Position Indicator: Not Applicable
- D. Hall lanterns: Not Applicable
- E. Special Equipment: Not Applicable

2.11 MISCELLANEOUS ELEVATOR COMPONENTS

- A. Oil Hydraulic Silencer: Install multiple oil hydraulic silencers (muffler device) at the power unit location. The silencers shall contain pulsation absorbing material inserted in a blowout proof housing.
- B. Lockable three phase circuit breaker with auxiliary contact with shunt trip capability to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb and should be sized according to the National Electrical Code.
- C. Lockable single phase 110V circuit breaker for cab light and fan to be provided. Circuit breaker to be located behind locked panel (Group 2 security access) at controller landing entrance jamb should be sized according to the National Electrical Code

PART 3 EXECUTION

3.01 EXAMINATION

- A. Before starting elevator installation, inspect hoistway, hoistway openings, pits and/or control room, as constructed, verify all critical dimensions, and examine supporting structures and all other conditions under which elevator work is to be installed. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the installer.
- B. Installation constitutes acceptance of existing conditions and responsibility for satisfactory performance.

3.02 INSTALLATION

- A. Install elevator systems components and coordinate installation of hoistway wall construction.
 - 1. Work shall be performed by competent elevator installation personnel in accordance with ASME A17.1, manufacturer's installation instructions and approved shop drawings.
 - 2. Comply with the National Electrical Code for electrical work required during installation.
- B. Perform work with competent, skilled workmen under the direct control and supervision of the elevator manufacturer's experienced foreman.
- C. Supply in ample time for installation by other trades, inserts, anchors, bearing plates, brackets, supports, and bracing including all setting templates and diagrams for placement.
- D. Welded construction: Provide welded connections for installation of elevator work where bolted connections are not required for subsequent removal or for normal operation, adjustment, inspection, maintenance, and replacement of worn parts. Comply with AWS standards for workmanship and for qualification of welding operators.
- E. Coordination: Coordinate elevator work with the work of other trades, for proper time and sequence to avoid construction delays. Use benchmarks, lines, and levels designated by the Contractor, to ensure dimensional coordination of the work.
- F. Install machinery, guides, controls, car and all equipment and accessories to provide a quiet, smoothly operating installation, free from side sway, oscillation or vibration.
- G. Alignment: Coordinate installation of hoistway entrances with installation of elevator guide rails for accurate alignment of entrances with cars. Where possible, delay final adjustment of sills and doors until car is operable in shaft. Reduce clearances to minimum safe, workable dimensions at each landing.
- H. Erect hoistway sills, headers, and frames before erection of rough walls and doors; erect fascia and toe guards after rough walls finished. Set sill units accurately aligned and slightly above finish floor at landings.
- I. Lubricate operating parts of system, where recommended by manufacturer.

3.03 FIELD QUALITY CONTROL

- A. Acceptance testing: Upon completion of the elevator installation and before permitting use of elevator, perform acceptance tests as required and recommended by Code and governing regulations or agencies. Perform other tests, if any, as required by governing regulations or agencies.

- B. Advise Owner, Contractor, Architect, and governing authorities in advance of dates and times tests are to be performed on the elevator.

3.04 ADJUSTING

- A. Make necessary adjustments of operating devices and equipment to ensure elevator operates smoothly and accurately.

3.05 CLEANING

- A. Before final acceptance, remove protection from finished surfaces and clean and polish surfaces in accordance with manufacturer's recommendations for type of material and finish provided. Stainless steel shall be cleaned with soap and water and dried with a non-abrasive surface; it shall not be cleaned with bleach-based cleansers.
- B. At completion of elevator work, remove tools, equipment, and surplus materials from site. Clean equipment rooms and hoistway. Remove trash and debris.
 - 1. Use environmentally preferable and low VOC emitting cleaners for each application type. Cleaners that contain solvents, pine and/or citrus oils are not permitted.

3.06 PROTECTION

- A. At time of Substantial Completion of elevator work, or portion thereof, provide suitable protective coverings, barriers, devices, signs, or other such methods or procedures to protect elevator work from damage or deterioration. Maintain protective measures throughout remainder of construction period.

3.07 DEMONSTRATION

- 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 normal procedures to be followed in checking for sources of operational failures or malfunctions.
- B. Make a final check of each elevator operation, with Owner's personnel present, immediately before date of substantial completion. Determine that control systems and operating devices are functioning properly.

3.08 ELEVATOR SCHEDULE (DUPLEX)

- A. **Elevator Qty. 2 PE1**
 - 1. Elevator Model: endura MRL Twinpost above-ground 3-stage
 - 2. Elevator Type: Hydraulic Machine Room-Less, Passenger

3. Rated Capacity: 3500 lbs.
4. Rated Speed: 100 ft./min.
5. Operation System: TAC32H
6. Travel: 28'-0"
7. Landings: 3 total
8. Openings:
 - a. Front: 1
 - b. Rear: 2
9. Clear Car Inside: 6'-8" wide x 5'-5 1/2" deep
10. Inside clear height: 7'-4" standard
11. Door clear height: 7'-0" standard
12. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
13. Door Type: One-speed | LH Side opening
14. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
15. Seismic Requirements: Zone
16. Hoistway Dimensions: 8'-8" wide x 7'-10 3/4" deep
17. Pit Depth: 4'-0"
18. Button & Fixture Style: Traditional Signal Fixtures
19. Special Operations: None
20. Digital Services:
 - Remote Monitoring with Application Programming Interface (API) Integration
 - ADA Phone - Code Compliant Cellular Connectivity
 - Smart Device Elevator Calling with occupant app API integration

B. Elevator Qty. 2 PE2

1. Elevator Model: endura MRL Twinpost above-ground 1-stage
2. Elevator Type: Hydraulic Machine Room-Less, Passenger
3. Rated Capacity: 3500 lbs.
4. Rated Speed: 110 ft./min.
5. Operation System: TAC32H
6. Travel: 14'-0"
7. Landings: 2 total
8. Openings:
 9. Front: 2
 10. Rear: 0
11. Clear Car Inside: 6'-8" wide x 5'-5" deep
12. Inside clear height: 7'-4" standard
13. Door clear height: 7'-0" standard
14. Hoistway Entrance Size: 3'-6" wide x 7'-0" high
15. Door Type: One-speed | LH Side opening
16. Power Characteristics: 460 volts, 3 Phase, 60 Hz.
17. Seismic Requirements: Zone
18. Hoistway Dimensions: 8'-4" wide x 6'-11" deep
19. Pit Depth: 4'-0"
20. Button & Fixture Style: Traditional Signal Fixtures

- 21.Special Operations: None
- 22.Digital Services:
- 23.Remote Monitoring with Application Programming Interface (API) Integration
- 24.ADA Phone - Code Compliant Cellular Connectivity
- 25.Smart Device Elevator Calling with occupant app API integration

3 ELEVATOR SCHEDULE (SIMPLEX)

C. Elevator Qty. 1 (PE3)

- 1) Elevator Model: endura MRL Twinpost above-ground 1-stage
- 2) Elevator Type: Hydraulic Machine Room-Less, Passenger
- 3) Rated Capacity: 3000 lbs.
- 4) Rated Speed: 110 ft./min.
- 5) Operation System: TAC32H
- 6) Travel: 14'-0"
- 7) Landings: 2 total
- 8) Openings:
- 9) Front: 2
- 10) Rear: 0
- 11) Clear Car Inside: 6'-8" wide x 4'-9" deep
- 12) Inside clear height: 7'-4" standard
- 13) Door clear height: 7'-0" standard
- 14) Hoistway Entrance Size: 3'-6" wide x 7'-0" high
- 15) Door Type: One-speed | LH Side opening
- 16) Power Characteristics: 460 volts, 3 Phase, 60 Hz.
- 17) Seismic Requirements: Zone
- 18) Hoistway Dimensions: 8'-4" wide x 6'-3" deep
- 19) Pit Depth: 4'-0"
- 20) Button & Fixture Style: Traditional Signal Fixtures
- 21) Special Operations: None
- 22) Digital Services:

C. Remote Monitoring with Application Programming Interface (API) Integration

D. ADA Phone - Code Compliant Cellular Connectivity

E. Smart Device Elevator Calling with occupant app API integration

F. 3.09 SPECIAL CONDITIONS Provision for Card Reader in Duplex Elevators. (Actual security is by others)

END OF SECTION

SECTION 32 14 00 – UNIT PAVING

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. Pavers
- 2. Permeable Pavers, a.k.a. Pervious Pavers
- 3. Edge Restraints
- 4. Setting Bed Materials
- 5. Joint Fillers
- 6. Aggregate Base Courses
- 7. Geotextile Fabrics
- 8. Drainage Pipe and Underdrains for Permeable pavers (see also Civil Engineer drawings)

- B. Related Sections Include (names may vary):

- 1. Division 1 Section "Summary"
- 2. Division 1 Section "Alternates"
- 3. Division 1 Section "Submittal Procedures"
- 4. Division 1 Sections "Substitutions"
- 5. Division 31 Section "Earth Moving" or "Earthwork" for compaction
- 6. Division 32 Section "Concrete" for concrete used in concrete bands.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site with Installer, Landscape Architect, Architect and Owner's Representative.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.
- B. Mockups: Build mockups of concrete pavers to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups for concrete pavers, indicating range of pattern and color selected for the project.

- a. Mockup sizes: four feet by four feet.
 - b. Build one mockup for the permeable paver system and one for the standard paver system.
 - c. Build mockups with pavers and materials specified, however any concrete sub-slabs indicated are not required for the mockups.
 - d. Combine paver field pattern and paver band pattern if indicated on drawings, in one mockup; include corner pattern for the paver band.
2. Build mockups away from areas of final paver construction, at location as reviewed by the Landscape Architect and Owners Representative.
 - a. Do not remove mockups until least 25% of final paver construction is completed for each mockup and a review is completed by Owners Representative and Landscape Architect for conformance with mockup.

1.5 ACTION SUBMITTALS

- A. Product Data: For materials other than water and aggregate setting-bed materials (joint material product data is required).
- B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C 136.
- C. Initial Paver Samples for Selection: Submit sample pavers for each paver color/finish specified in Part 2. For paver blends provide sufficient quantity to show the range of the blend.
 1. For paver color/finish specified herein, review with Landscape Architect prior to ordering to understand design intent, and order initial samples for each color/finish, using a range of custom color/custom aggregate (and white cement for light pavers) and finishes as described in 1.5.C.2 and Part 2 below.
 - a. Cost of the custom initial samples is to be included in the base bid of this project; custom sample costs are anticipated since this project has relatively small square footages.
 - b. A second round of initial samples may be required if the first round does not produce acceptable results, at the sole discretion of the Landscape Architect, at no additional cost to Owner or impact on project schedule.
 2. Submit Initial Samples a minimum of two months prior to date of anticipated *ordering* final material.
 - a. Provide the samples in color/texture/finish/aggregate/cement described herein; participate in a meeting with Landscape Architect prior to ordering samples to discuss selecting initial samples.
 - 1) For Hanover concrete pavers, also include one additional close option for each color/texture/finish/aggregate/cement selections indicated herein.
 - 2) For Unilock concrete pavers, include one Umbriano finish paver and one Series finish paver for each color/texture/finish/aggregate/cement selections indicated herein.
 - 3) For Whitacre Greer brick pavers, submit samples of the full range of standard and custom colors available.
 - b. Account for lead time of custom manufacturing and shipping, between date of ordering and date of delivery.

- c. A lack of planning ahead and cost issues will not be acceptable reasons for using only standard / in-stock colors/finishes; this project uses made-to-order custom colors/aggregates/cement/finishes.
 - d. Contact manufacturer regarding lead times and custom orders a maximum of two months after the Notice to Proceed has been issued, and as required to meet project installation schedules; notify the Landscape Architect that this contact has been made and immediately review any issues and concerns with the Landscape Architect.
 - 3. Deliver samples to the Owner's Representative and deliver duplicates directly to the Landscape Architect's office.
 - 4. Landscape Architect will select Final Selections for color/texture/finish.
- D. Samples for Verification: For pavers and related materials.
- 1. Three full-size units of each selected color and shape of unit paver – from project's production batches – for concrete pavers.
 - 2. Setting bed material and joint material(s).
 - 3. Deliver samples to Owners Representative and deliver another batch directly to Landscape Architect's office.

1.6 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.
 - 1. For solid concrete paving units, include test data for freezing and thawing according to ASTM C 1645 / C 1645 M; and absorption, dimensional tolerance and compressive strength according to ASTM C9 36.
 - 2. For solid brick paving units, include test data for freezing and thawing, psi and related items, according to ASTM C 67.
 - 3. For permeable paver systems, include infiltration flow rate through the pavers, plus flow rate accounting for manufacturers recommended aggregate joint filler, according to ASTM C 1781 / 1781 M or equal.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store pavers 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.
- B. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- C. Store liquids in tightly closed containers protected from freezing.

1.8 PROJECT CONDITIONS

- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

1.9 TOLERANCES

- A. Maximum Paver-to-Paver Lippage: 1/16-inch, no plus.
 - 1. Check paver-to-paver lippage 60 days after installation and reset pavers that do not meet specified lippage, and add joint filler as required.
 - 2. Re-check areas of reset pavers 60 days after resetting pavers and make corrections necessary to meet specified lippage, and add joint filler as required.
- B. Surface Tolerances for Pavers: 1/4 inch maximum (vertical) in 10 feet, plus or minus 1/16".
- C. Joint Alignment Tolerances at unit pavers: 1/16-inch maximum variance in 10 feet (1/32-inch maximum on either side of a string line, no plus).

1.10 DEFINITIONS

- A. Owner: Montgomery County.
- B. Owner's Representative: Project Manager or Project Management Company employed by the Owner. The Owner may delegate specific Owner's Representative responsibilities to the Architect, Landscape Architect and Engineer.

PART 2 - PRODUCTS

2.1 CONSISTENCY OF PRODUCT - GENERAL

- A. Pavers in both permeable and non-permeable systems shall be the same permeable product(s) including colors, shape, finish, and location of manufacture.

2.2 PAVER THICKNESS

- A. Thicknesses of the pavers in bands and fields shall be manufactured in matching thicknesses.

2.3 PAVERS – BOTH PERMEABLE AND NON-PERMEABLE SYSTEMS

- A. Pavers for Paver Fields - select from one of the following permeable pavers:
 - 1. Permeable 3.5 inch x 18 inch x 4 inch deep concrete pavers as manufactured by Hanover Architectural Products, Hanover PA.
 - a. Solid paving units complying with ASTM C 936 for 8,000 psi, and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates, selected from one of the following:
 - b. Chamfer: manufacturer's standard.
 - c. Nubs for allowing drainage: manufacturer's standard.
 - d. Joint Width: ADA compliant.

- e. Finish: Tudor.
 - f. Rating: Pedestrian.
 - g. Colors: Blend of 3 colors, "A", "B", and "C" as selected by Landscape Architect from manufacturers full range of custom colors, cement and aggregates.
 - 1) For purposes of bidding, use matrixes B91875, B92127, and B91856; these selections are not for construction unless specifically selected by Landscape Architect during the submittal review process.
 - 2) Use colors in ratios of 1/3 each unless otherwise approved by Landscape Architect; Landscape Architect reserves the right to specify 1, 2 or 3 total colors for the color blend
 - h. Final color selection: as approved by Landscape Architect from initial samples; contact Landscape Architect for selections for initial samples, which shall include the numbers stated above, and a similar color for each number.
2. Permeable Boardwalk Clay Brick Pavers as manufactured by Whitacre Greer, Alliance OH.
- a. Solid paving units complying with ASTM C902 or ASTM C1272.
 - b. Manufacturing Process: Dry pressed.
 - c. Size: 2 1/4" x 9 inches x 3 inches deep.
 - d. Void Space: 11%.
 - e. Chamfer: manufacturer's standard for Permeable Boardwalk pavers.
 - f. Nubs for allowing drainage: manufacturer's standard.
 - g. ADA compliant joint width of 3/10".
 - h. Rating: Vehicular or Pedestrian.
 - i. Colors: Blend of 3 colors, "A", "B", and "C" as selected by Landscape Architect selecting from these from manufacturers full range of standard and custom colors (including #30, 32, 33, 34,36 and other available colors).
 - 1) Use colors in ratios of 1/3 each, unless otherwise approved by Landscape Architect. Landscape Architect reserves the right to specify 1, 2 or 3 total colors for the color blend.
 - j. Final color selection: as approved by Landscape Architect from initial samples.
3. Customized Eco-Promenade 3"x12"x4" thick permeable pavers as manufactured by Unilock, from full custom and standard range of Umbriano Finishes and Series Finishes, as available at a plant in the eastern United States or Ontario, as selected by Landscape Architect.
- a. Solid paving units complying with ASTM C 936 for 8,000 psi, and resistant to freezing and thawing when tested according to ASTM C 67, made from normal-weight aggregates, selected from one of the following:
 - b. Chamfer: manufacturer's standard.
 - c. Nubs for allowing drainage: manufacturer's standard.
 - d. Joint Width: ADA compliant.
 - e. Color, Aggregates and Finish: Umbriano finish or Series finish, including custom colors (including technologies of EnduraColor Plus, Untima, REALA, ColorFusion and EasyClean, with granite and quartz aggregates—as applicable), as selected by Landscape Architect from full range of standard and custom types available from eastern United States and Ontario plants, for all paver types.
 - f. Rating: Pedestrian or Vehicular.
 - g. Colors: Blend of 3 colors, "A", "B", and "C" as selected by Landscape Architect from manufacturers full range of custom and standard colors, cement, finishes, and aggregates.

- 1) For purposes of bidding, use Umbriano finish with EnduraColor Plus technology and EasyClean: Midnight Sky (Umbriano Mottled), Winter Marvel (Umbriano Mottled), French Gray (Umbriano Mottled), and Grenada White (Umbriano Mottled); these selections are not for construction unless specifically selected by Landscape Architect during the submittal review process.
 - a) Landscape Architect reserves the right to select Series Finish from the full range of available colors, including but not limited to: Crystalline Basalt, Ice Gray, and Mineral Ice Gray, in lieu of the Umbriano Finish.
- 2) Use colors in ratios of 1/3 each. Landscape Architect reserves the right to specify 1, 2 or 3 total colors for the color blend.
- h. Final color and finish selection: as approved by Landscape Architect from initial samples.

B. Pavers for Paver Bands:

1. Same manufacturer and product size as approved for Field Pavers.
2. Match product material, texture, chamfer, nubs width, thickness, and quality of approved Field Pavers.
3. Final color selection: as approved by Landscape Architect from initial samples.
4. Color: One color, "D" as selected from full standard and custom range of pervious pavers from Hanover, Whitacre Greer and Unilock.
 - a. For Hanover concrete pavers for purposes of bidding, use Tudor Superblack or similar dark paver as selected by Landscape Architect.
 - b. For Whitacre Greer pavers for purposes of bidding, use full range of standard and custom colors.
 - c. For Unilock pervious pavers for purposes of bidding, use full range of standard colors and custom colors using Umbriano (with EnduraColor Plus) available in the eastern United States and Ontario; including but not limited to Midnight Sky.
 - 1) Landscape Architect reserves the right to select Series Finish from the full range of available colors, including but not limited to Black Granite for Color D.
 - d. These selections are not for construction unless specifically selected by Landscape Architect during the submittal review process.

2.4 EDGE RESTRAINT

- A. Concrete band as indicated.

2.5 SETTING-BED MATERIAL FOR PAVERS (NON-PERMEABLE SYSTEMS)

- A. Provide setting bed with depth as indicated on drawings:
1. ASTM C33 sand.

2.6 JOINT MATERIAL FOR PAVERS (NON-PERMEABLE SYSTEMS)

- A. Use same crushed stone joint filler as in permeable system.

2.7 SETTING BED MATERIAL FOR PERMEABLE PAVERS

- A. Clean washed crushed stone, size as indicated.

2.8 PERMEABLE JOINT MATERIAL FOR PERMEABLE PAVERS (PERMEABLE SYSTEMS)

- A. Clean, washed, angular crushed stone suitable for permeable unit paving joints, complying with the following requirements.
 - 1. Crushed stone aggregate sized per manufacturer's written instructions.
 - 2. Gradation: aggregate conforming to AASHTO No. 10, or 1mm to 3mm crushed stone, or smaller size if required by the paver manufacturer, with the following requirements:
 - a) 100% passing the 3/8-inch sieve
 - b) Minimum 85 percent passing the No. 4 sieve (4.75mm)
 - c) No more than 2 percent passing the No. 200 sieve.
 - d) Free of fines, dust, clay, cement, polymers, resins, or other binding agents
 - 3. Aggregate able to freely enter and fill joints without bridging or segregation.
 - 4. Aggregate compatible with the permeable unit paving system and allow vertical and lateral drainage.
 - 5. AASHTO No. 8 aggregate is not permitted.
 - 6. Stone material: Diabase (Trap Rock) – dark gray to charcoal in color, free from organic matter and other deleterious substances.
 - 7. No limestone.
 - 8. Minimum 100% of material produced by mechanical crushing of parent rock to ensure angularity.

2.9 SUBBASE AGGREGATE FOR NON-PERMEABLE SYSTEMS

- A. PennDOT 2A aggregate from crushed stone source, meeting requirements in PennDOT Publication 408/2020, restricted as follows:
 - 1. No recycled concrete.
 - 2. No crushed limestone.

2.10 SUBBASE AGGREGATE FOR PERMEABLE PAVERS AND UNDERDRAINS

- A. PennDOT or AASHTO aggregate, sizes and types as indicated, from crushed stone source, meeting requirements in PennDOT Publication 408/2020 or AASHTO, restricted as follows:
 - 1. Clean washed stone.
 - 2. No recycled concrete.
 - 3. No crushed limestone.

2.11 RELATED MATERIALS

- A. Non-woven Geotextile: PennDOT 735 Class 4 Type A, with AOS 70-100 Sieve.
- B. Woven Geotextile: PennDOT 735 Class 4 Type B.
- C. Pipe at Pavement Area and Connections: Perforated and non-perforated schedule 40 PVC pipe, ASTM D2665, size as indicated, unless otherwise specified by Civil Engineer.

- D. Fittings, flow control and connections: as specified or approved by Civil Engineer.
- E. Cleanout caps and inspection caps at underdrain systems: as specified by Civil Engineer.
 - 1) Paint with primer and two coats black paint if the cap is plastic in color of green or white.

PART 3 – EXECUTION

3.1 INSTALLATION GENERAL

A. EXAMINATION

- 1. Examine areas indicated to receive paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
- 2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Verify that subgrade is thoroughly compacted. Remove unsuitable material and replace with material complying with Division 31 Section "Earth Moving", and as required by civil engineer and geotechnical engineer.
 - 1. Review subgrade material and subgrade compaction with geotechnical engineer prior to proceeding with the installation.
- B. String grade lines for the entire length of the work to conform to given lines and grades described or on drawings to allow for visual inspection.
 - 1. Provide positive surface drainage away from building, towards stormwater inlets and off-site;
 - 2. Do not cause ponding at paver and paved areas.
- C. At permeable systems, place nonwoven geotextile over the subgrade, overlapping 12" minimum, and up the sides of the excavation, leaving a minimum of 12" to overlap over the top corners.
- D. At non-permeable systems, place woven geotextile over the subgrade, overlapping 12" minimum and up the sides of the excavation.
- E. Install and compact the base aggregate.
 - 1. Review compaction with geotechnical engineer prior to proceeding with the work.
- F. At permeable systems, install perforated pipe in the base aggregate, or under the base aggregate as an underdrain, as indicated on drawings, and if not indicated, as directed by Civil Engineer with review by Landscape Architect.

1. Connect to stormwater system per Civil Engineer, including flow control equipment at nearest storm inlet if indicated by Civil Engineer.
 2. Provide black-capped cleanout pipe at beginning of each run of perforated pipe at landscape areas and metal cleanout cap at beginning of each run in paved areas – unless otherwise indicated by Civil Engineer.
- G. At permeable systems, place geotextiles as indicated and overlap 12-inches minimum with the geotextile on the sides/bottom.
- H. At non-permeable systems do not put geotextile above the PennDOT 2A base aggregate.

3.3 PAVERS FOR PAVER BANDS

- A. Drawings indicate nominal-width Paver Bands, using pavers in the range of 3 inches to 3.5 inch width (for Hanover and Unilock); bands using those manufacturers pavers shall be 3-pavers wide.
1. For Whitacre Greer pavers, which are 2.25" wide, install bands that are 5-pavers wide.
 2. Adjust quantities of fields and bands as required for actual paver dimensions and specified rows.

3.4 SAND AND STONE CHIP SETTING-BED APPLICATIONS

- A. Place leveling course and screed to a thickness as indicated on Drawings.
- B. Set pavers that have spacer bars hand-tight against spacer bars. Set pavers without spacer bars with minimum joint width of 1/16 inch and a maximum of 1/16 inch.
- C. Lay in patterns indicated, or if not indicated, as selected by Landscape Architect.
- D. Vibrate concrete pavers into leveling course as recommended by paver manufacturer, and hand-tamp brick pavers into leveling course as recommended by paver manufacturer. On concrete pavers, use vibrator with neoprene mat on face of plate or other means as needed to prevent cracking and chipping of pavers. Perform at least three passes across paving with vibrator.
1. Compact concrete pavers when there is sufficient surface to accommodate operation of vibrator, leaving at least 36 inches of uncompacted pavers adjacent to temporary edges.
 2. Before ending each day's work, compact installed pavers except for 36- inch width of uncompacted pavers adjacent to temporary edges (laying faces).
 3. As work progresses to perimeter of installation, compact installed pavers that are adjacent to permanent edges unless they are within 36 inches of lying face.
 4. Before ending each day's work and when rain interrupts work, cover pavers that have not been compacted and cover leveling course on which pavers have not been placed with nonstaining plastic sheets to protect them from rain.

- F. Fill joints with material indicated on the drawings and herein immediately after vibrating or tamping pavers into leveling course; comply with paver manufacturer's written instructions for filling joints, vibrating/tamping, watering, and sweeping.
- G. Use geotextile to prevent aggregates and setting beds from migrating between permeable systems and non-permeable systems.
- F. Do not allow traffic on installed pavers until joint filler has been vibrated or tamped into joints.
- H. Repeat joint-filling process 30 days later.

3.5 EDGE RESTRAINTS

- A. Install per manufacturer's installation instructions, and as indicated if stricter. Provide a secure installation. For non-manufacturer items, install as indicated and as required for a stable assembly.
- B. Where manufactured edge restraint over concrete over concrete is indicated, pin/secure the edge restraint into the concrete as required for secure installation.
- C. Where manufactured edge restraint is indicated, extend base course and concrete subslab past edge of pavers as indicated on Drawings, or if not indicated, then extend concrete 4 inches past edge of pavers, and extend aggregate 6 inches past edge of pavers.
- D. Where concrete band or concrete curb is indicated as edge restraint adjacent to paver areas, install prior to placing pavers.

3.6 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.
- B. Cleaners: Any cleaner specifically designed for pavers may be used for Color restoration or general cleaning. Follow manufacturer's dilution rates and application procedures. Always test a small area to make sure the results are as expected.

END OF SECTION

SECTION 32 92 00 - TURF AND GRASSES

Utilize Sod for project lawns.

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. Fine grading and preparing seeded areas.
 - 2. Spreading topsoil from stockpile.
 - 3. Furnishing and applying topsoil.
 - 4. Furnishing and applying soil amendments.
 - 5. Furnishing and applying fertilizers.
 - 6. Seeding & sod installation.
 - 7. Turf renovation.
 - 8. Reseeding and sod installation at unsatisfactory or damaged areas.
 - 9. Mulch applications.
 - 10. Erosion control blanket applications.
- B. Related Sections Include (names and numbers may vary):
 - 1. Division 1 Section "Summary"
 - 2. Division 1 Section "Alternates"
 - 3. Division 1 Section "Submittal Procedures"
 - 4. Division 1 Section "Substitutions"
 - 5. Division 31 Section "Erosion and Sedimentation Control"
 - 6. Division 31 Section "Earth Moving"
 - 7. Division 32 Section "Plants"

1.3 DEFINITIONS

- A. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- B. Finish Grade: Elevation of finished surface of planting soil.
- C. Manufactured Topsoil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- D. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

- E. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. These include geese, deer, insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- F. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- G. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or top surface of a fill or backfill before planting soil is placed.
- H. Subsoil: All soil beneath the topsoil layer of the soil profile and typified by the lack of organic matter and soil organisms.
- I. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil, but in disturbed areas such as urban environments, the surface soil can be subsoil.
- J. Owner: Montgomery County, PA
- K. Owner's Representative: Project Manager or Project Management Company employed by the Owner. The Owner may delegate specific Owner's Representative responsibilities to the Architect, Landscape Architect and Engineer.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
 - 1. Pesticides and Herbicides: Include product label and manufacturer's application instructions specific to this Project.

1.5 INFORMATIONAL SUBMITTALS

- A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- B. Certification of Grass Seed used in Sod: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
- C. Qualification Data: For qualified landscape Installer.
- D. Product Certificates: For soil amendments and fertilizers, from manufacturer.
- E. Material Test Reports: For standardized ASTM D 5268 topsoil existing native surface topsoil

existing in- place surface soil and imported or manufactured topsoil.

1. If existing subsoil will be used as a component of planting soil mix, then also provide Material Test Reports for the subsoil from the source being utilized.
- F. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of turf and meadows during a calendar year. Submit before expiration of required Contractor's maintenance periods.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf and meadow establishment.
1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in turf installation in addition to requirements in Section I – "Supplementary Conditions."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation maintenance specialty area(s), designated CLT-Exterior.
 - b. Certified Turfgrass Professional, designated CTP.
 - c. Certified Turfgrass Professional of Cool Season Lawns, designated CTP-CSL.
 5. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent laboratory or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed, as well as the experience and capability to provide the recommendations and interpretations required.
1. Qualified independent soil-testing laboratories include, but are not limited to:
 - a. Earth Works, Martins Creek, Pennsylvania; phone: 800-732-TURF, partnering with a soil testing agency.
 - 1) At a minimum, provide soil testing as required herein.
 - 2) Provide amendment recommendations for turf as test 1, and native trees and shrubs for Test 2, for each soil source.
 - b. Penn State College of Agricultural Sciences.
 - 1) At a minimum provide: Particle Size and Sand Sieve Test, Soil Fertility Test (including Organic Matter, Soluble Salts, Nitrate Nitrogen, Ammonium Nitrogen, Total Nitrogen Combustion, Total Carbon Combustion, and Micronutrients), gravel content test, heavy metals test, identification of deleterious materials, and other testing required herein.
 - 2) Provide amendment recommendations for turf as test 1, and native trees and shrubs for Test 2, for each soil source.

- 3) An independent soil scientist hired by the Contractor will be required for interpretation and recommendations if the lab does provide that service for each interpretation or recommendation required herein.
- c. Rutgers New Jersey Agricultural Experiment Station, Soil Testing Laboratory.
- 1) At a minimum provide: Topsoil Evaluation test (soil fertility, soluble salt level, organic matter content, sand/silt/clay, textural class, and gravel content), Soil Health Test, heavy metals test, identification of deleterious materials, and other testing required herein
 - 2) Provide amendment recommendations for turf as test 1, and native trees and shrubs for Test 2, for each soil source.
 - 3) An independent soil scientist hired by the Contractor will be required for interpretation and recommendations if the lab does provide that service for each interpretation or recommendation required herein.
- C. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 2. The soil-testing laboratory shall oversee soil sampling, with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 3. Report suitability of tested soil for turf growth; in addition, report suitability of tested soil for native plants for Section 329300, Plants (two tests are required for each soil source).
 - a. Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
- D. Provide the Owner's Representative and Landscape Architect with copies of soil test results a minimum of 60 days prior to any grading, seeding or sodding – for EACH SOIL SOURCE.
1. Soil test submittals must include complete lab recommendations.
- E. The seed producer shall specialize in grass seed production with a minimum of 5 years' experience and shall be certified by the Pennsylvania Department of Agriculture as outline in Title 3 (Agriculture) of the Pennsylvania Consolidated Statutes.
- F. Seed must comply with Commonwealth of Pennsylvania seed certifications or equivalent State of New Jersey seed certifications.
- G. Preinstallation Conference: Conduct conference at Project site, including Owner's Representative and Landscape Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws, as applicable.
- B. Sod: Sod shall be reviewed by the Owner's Representative or Landscape Architect at the job site prior to installation. The Owner's Representative or Landscape Architect reserves the right to reject any sod they deem unacceptable.
 - 1. Sod delivered from the supplier shall be installed on the same day as delivery.
 - 2. Each palette, flat, or specified group of sod shall be labeled by the grower or manufacturer as separate items.
 - 3. During delivery and storage, sod materials shall be protected from any drying or contamination by detrimental material.
 - 4. Sod shall not be dropped or dumped from vehicles.
- C. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk fertilizers, lime, and soil amendments with appropriate certificates.

1.8 PROJECT CONDITIONS

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.
 - 1. Spring Planting: 15 March to 15 May.
 - 2. Fall Planting: 15 August to 15 October.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

1.9 MAINTENANCE SERVICE

- A. Initial Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after each area is planted and continue until acceptable turf is established but for not less than the following periods:

1. Initial Maintenance of Seeded Turf and Sod: 60 days from date of Substantial Completion issued for the overall project, or 60 days from date of Substantial Turf Completion as determined by Owner's Representative, or until initial acceptance to start the Maintenance and Guarantee Period, whichever is later.
 - a. When initial maintenance period has not elapsed before November 1, or if turf is not fully established, continue maintenance during next growing season.
- B. Maintenance Service During the 90-day Maintenance and Guarantee Period: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in Part 3.
 1. When Maintenance and Guarantee Period has not elapsed before November 1, then extend as described in Part 3.

PART 2 - PRODUCTS

2.1 SEED

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.
- B. Seed Species for turf renovation, and alongside sod: as described on Drawings and as follows:
 1. PennDOT Formula B, proportioned by weight as follows:
 - a. 50 percent Kentucky bluegrass (*Poa pratensis*).
 - b. 30 percent chewings red fescue (*Festuca rubra* variety).
 - c. 20 percent perennial ryegrass (*Lolium perenne*).
 2. The Owner's Representative may request or allow a turf-type tall fescue blend for areas next to turf-type tall fescue sod.

2.2 SOD

- A. The sod producer shall specialize in grass seed production with a minimum of 5 years' experience and shall be certified by the Pennsylvania Department of Agriculture or the New Jersey Department of Agriculture.
- B. Sod shall be a minimum of 18 months in age with root development that will support its own weight without tearing when suspended vertically by holding two adjacent corners.
- C. Sod shall be field grown in same climatic conditions as that of the project site.
- D. Sod shall be free of weeds and undesirable grasses.
- E. Sod must be capable of growth and development when planted.
- F. Sod shall be free of pests.

- G. Composition of seed blend shall be a minimum of 3 different turf type tall fescue varieties, with a blended ratio of 20% to 40% of each variety for a total of 100%. Varieties shall represent the top 1/3 of performers in the most recent final or current year National Turfgrass Evaluation Program (www.ntep.org) for the Northeast USA. In addition, one of the varieties must be a rhizomatous type as advertised by the seed marketer.
 - 1. Blend may include up to 10% Kentucky Bluegrass for stability.
- H. Sod shall be installed within 24 hours from the time it is cut.
- I. Products:
 - 1. Tall Fescue sod as grown by Shan Gri La Sod Farm, Perkasee, PA,
 - 2. Tall Fescue sod as grown by Tuckahoe Sod Farms, Hammonton, NJ,
 - 3. Tall Fescue sod as grown by Sporting Valley Turf Farms, Manheim, PA,
 - 4. Or approved equal.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: T, with a minimum of 99 percent passing through No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through No. 60 (0.25-mm) sieve.
 - 2. Class: O, with a minimum of 95 percent passing through No. 8 (2.36-mm) sieve and a minimum of 55 percent passing through No. 60 (0.25-mm) sieve.
 - 3. Provide lime in form of ground dolomitic limestone.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, and with a minimum of 99 percent passing through No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Aluminum Sulfate: Commercial grade, unadulterated.
- E. Perlite: Horticultural perlite, soil amendment grade.
- F. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through No. 50 (0.30-mm) sieve.
- G. Sand: Clean, washed, natural or manufactured, and free of toxic materials.
- H. Diatomaceous Earth: Calcined, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- I. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.4 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8;

moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch (19-mm) sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
 2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Wood Derivatives: Decomposed, nitrogen-treated sawdust, ground bark, or wood waste; of uniform texture and free of chips, stones, sticks, soil, or toxic materials.
1. In lieu of decomposed wood derivatives, mix partially decomposed wood derivatives with ammonium nitrate at a minimum rate of 0.15 lb/cu. ft. (2.4 kg/cu. m) of loose sawdust or ground bark, or with ammonium sulfate at a minimum rate of 0.25 lb/cu. ft. (4 kg/cu. m) of loose sawdust or ground bark.
- C. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.6 PLANTING SOILS

- A. Planting Soil: Existing, in-place surface soil. Verify suitability of existing surface soil to produce viable planting soil. Remove stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix surface soil in the quantities recommended in soils reports for each planting type- lawn and native plants- from a qualified soil-testing laboratory and as directed by Landscape Architect to produce planting soil.
1. Supplement with another specified planting soil when quantities are insufficient.

- B. Planting Soil (supplemental): Imported ASTM D 5268 topsoil and/or ASTM D 5268 manufactured topsoil from off-site sources, with 4% to 8% organic matter, with pH range of 5.5 to 7, free of extraneous materials harmful to plant growth. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from agricultural land, bogs or marshes.
1. Additional Properties of Imported Topsoil and Manufactured Topsoil: Screened and free of stones 1 inch or larger in any dimension; free of roots, plants, sod, clods, clay lumps, pockets of coarse sand, paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials harmful to plant growth; free of obnoxious weeds and invasive plants including but not limited to quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, brome grass, Japanese knotweed, and giant reed; not infested with nematodes, grubs, other pests, pest eggs, or other undesirable organisms and disease-causing plant pathogens; friable and with sufficient structure to give good tilth and aeration. Continuous, air-filled, pore-space content on a volume/volume basis shall be at least 15 percent when moisture is present at field capacity. Soil shall have a field capacity of at least 15 percent on a dry weight basis.
 - a. Texture Class: Loam – approximately 40% sand, 40% silt and 20% clay
 - 1) Loam percentage limits: 23-52% sand, 28-50% silt, 7-27% clay
 2. Mix imported topsoil or manufactured topsoil in the quantities recommended in soils reports for each planting type- lawn and native plants- from a qualified soil-testing laboratory and as reviewed by Landscape Architect to produce planting soil.
 3. Planting Soil for Tree Pits and Suspended Paving System Cells: Imported manufactured planting soil conforming to requirements herein, however refer to further requirements indicated on Drawings, and utilize Loam or Sandy Loam.

2.7 MULCHES

- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
1. Hay is not acceptable.
- B. Fiber Mulch (not applicable to Trail Junction Project): Biodegradable, dyed-wood, cellulose-fiber mulch; nontoxic and free of plant-growth or germination inhibitors; with a maximum moisture content of 15 percent and a pH range of 4.5 to 6.5.
- C. Non-asphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.
- D. Asphalt Emulsion: ASTM D 977, Grade SS-1; nontoxic and free of plant-growth or germination inhibitors.

2.8 PESTICIDES

- A. General: Pesticide, registered and approved by EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
- B. Pre-Emergent Herbicide (Selective and Non-Selective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
- C. Post-Emergent Herbicide (Selective and Non-Selective): Effective for controlling weed growth that has already germinated.

2.9 EROSION-CONTROL MATERIALS

- A. Erosion Control Blankets for Seeded Areas – as indicated on Drawings, or if not indicated, then the following:
 - 1. At slopes 3:1 and steeper - NAG SC150 BN, or approved equal (no plastic netting).
 - 2. At slopes less steep than 3:1 – NAG SC 75BN, or NAG SC150BN, or approved equal (no plastic netting).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil- bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Prior to grading and seeding, treat weed species with a systemic herbicide that does not have soil activity, to help prevent roots of persistent species from re-sprouting.
 - 1. Persistent species include but are not limited to Giant Reed, Thistle, Mugwort, Japanese Knotweed, Oriental Bittersweet, Tree of Heaven and any non-native species that can re-sprout from roots.
 - 2. Proceed with grading and seeding only after persistent weed species have been treated, and after the herbicide has taken effect.
 - a. Provide a waiting period as recommended by the manufacturer before re-seeding.

3.3 TURF AREA PREPARATION

- A. Limit turf subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 8 inches (200 mm) .
 - 1. Apply superphosphate fertilizer directly to subgrade before loosening.
 - 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 - b. Mix lime with dry soil before mixing fertilizer.
 - 3. Spread planting soil to a depth of 12 inches at trees, shrubs and herbaceous plants, and to a depth of 4 inches at areas that are exclusively lawn, but not less than required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. At 12 inch planting soil depth areas, spread approximately 1/3 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 4 inches of subgrade. Spread remainder of planting soil.
 - b. At 4 inch deep planting soil depth areas, spread approximately 1/2 the thickness of planting soil over loosened subgrade. Mix thoroughly into top 2" of subgrade. Spread remainder of planting soil.
 - c. Reduce elevation of planting soil to allow for soil thickness of sod.
- C. Unchanged Subgrades: If turf is to be planted in areas unaltered or undisturbed by excavating, grading, or surface-soil stripping operations, prepare surface soil as follows:

1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
2. Loosen surface soil to a depth of at least 6 inches (150 mm). Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches of soil. Till soil to a homogeneous mixture of fine texture.
 - a. Apply superphosphate fertilizer directly to surface soil before loosening.
3. Remove stones larger than 2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property
 - a. Do not export soil from the Site Package areas; use on site as indicated.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
- E. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.
- C. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 1. Do not use wet seed or seed that is moldy or otherwise damaged.
 2. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a the rate recommended by seed provider or state agency, whichever is denser.
- C. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with erosion-control blankets as follows:
 1. At slopes 3:1 and steeper - NAG SC150 BN, or approved equal.

2. At slopes less steep than 3:1 – NAG SC 75BN, or NAG SC150BN, or approved equal.
 3. Install according to manufacturer's written instructions.
- E. Protect small seeded areas at sod interface with renovated lawn (maximum 10 square feet per area, maximum 12 inch width) with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand.
1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.
 2. Bond straw mulch by spraying with asphalt emulsion at a rate of 10 to 13 gal./1000 sq. ft.. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- F. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch and roll surface smooth.

3.6 SOD INSTALLATION

- A. Lay sod on the same day as delivery to prevent dehydration.
- B. Lay sod tight with no open joints visible, and no overlapping. Stagger end joints 12 inches minimum. Do not stretch sod pieces.
- C. Lay smooth and align with adjoining grass areas. Place top elevation of sod even with or slightly above adjoining edging, paving, or curbs to allow for settling.
1. At interface with existing grass areas, apply lawn seed to disturbed and bare portions of the existing lawn to a 2-foot maximum wide area.
- D. On slopes exceeding 2 horizontal to 1 vertical (and as specified below), lay sod perpendicular to the slope and secure every row with biodegradable staples at maximum of 2 feet on center. Drive staples flush with soil portion of the sod.
1. Use same stapling pattern for sod on this project, regardless of slope.
- E. Water sodded areas immediately after installation with enough moisture to ensure the entire rootmass and thatch areas are completely saturated.
- F. After sod and soil have dried, roll sodded areas to ensure a good bond between sod and soil and to remove minor depressions and irregularities.

3.7 HYDROSEEDING – NOT ALLOWED (3.7 text below is void)

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
1. Mix slurry with non-asphaltic, asphalt-emulsion fiber-mulch manufacturer's recommended tackifier.

2. Apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.
3. Apply slurry uniformly to all areas to be seeded in a two-step process. Apply first slurry coat at a rate so that mulch component is deposited at not less than 500-lb/acre (5.2-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate. Apply slurry cover coat of fiber mulch (hydromulching) at a rate of 1000 lb/acre (10.4 kg/92.9 sq. m).

3.8 TURF RENOVATION

- A. Renovate existing turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles, and renovate existing turf in areas indicated on Drawings.
 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 2. Install new planting soil as required.
- B. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- C. Remove topsoil containing foreign materials such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- D. Mow, dethatch, core aerate, and rake existing turf.
- E. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- F. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- G. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- H. Apply soil amendments and initial fertilizers required for establishing new turf and mix thoroughly into top 4 inches of existing soil.
 1. Install new planting soil to fill low spots and meet finish grades.
- I. Apply seed and protect with straw mulch or erosion control blanket as required for new turf.
- J. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

- A. Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials

and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 2. In areas where mulch or blanket has been disturbed by wind or maintenance operations, add new mulch or blanket as specified for new turf and anchor as required to prevent displacement.
 3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 2. Water turf with fine spray at a minimum rate of 1 inch per week unless rainfall precipitation is adequate.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
1. Mow lawn to a height of 2 inches when it reaches 3 inches.
- D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to turf area.

3.10 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 2 by 2 inches; follow Erosion and Sedimentation Control requirements if stricter.
 2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, dead edges, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents in accordance with requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Non-Selective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- C. Remove nondegradable erosion-control measures after grass establishment period.

3.13 MAINTENANCE PRIOR TO THE INSPECTION TO DETERMINE BEGINNING OF MAINTENANCE AND GUARANTEE PERIOD.

- A. Contractor shall maintain all seeded and sodded areas by properly mowing, watering, weeding and similar care to keep the completed work and uncompleted work in a clean and neat condition at all times. Sweep adjacent walks clean. Advise the Owner's Representative and Landscape Architect, in writing, when completed and maintained work is in proper condition to meet requirements for beginning of the Maintenance and Guarantee Period. The Owner's Representative and Landscape Architect, at their discretion, may segregate the maintenance period start date for the lawn areas from the maintenance period start date for other plantings.
 - 1. Mow when the lawn reaches 3 to 4 inches height, and mow to 2 to 3 inches height, removing no more than 1/3 of the grass blades. Mow only with reel-type mower, and use string-trimmers along edges.

3.14 INSPECTION OF THE WORK TO DETERMINE BEGINNING OF MAINTENANCE AND GUARANTEE PERIOD.

- A. The guarantee period will commence when the lawn areas have germinated properly, and sod has been installed properly and is thriving, and it is determined by the Landscape Architect that there is a reasonably full stand of turf and that it has been maintained properly. The Landscape Architect will approve lawn areas as acceptable to begin the 90 day maintenance and guarantee period.
 - 1. When all work, except maintenance work during the guarantee period, is completed, notify the Owner's Representative and Landscape Architect that the work is ready to be inspected for initial acceptance.

2. When all work, except maintenance work during the guarantee period, is approved for initial acceptance, the date of the approval shall be the date that the maintenance and guarantee period commences.

3.15 MAINTENANCE OF LAWN AREAS DURING THE MAINTENANCE AND GUARANTEE PERIOD

- A. Contractor shall provide all maintenance work, including watering, mowing, trimming and weed control, throughout the period of their guarantee of the work.
 1. Mow grass when it reaches 3 to 4 inch height; cut to 2-3" height by cutting no more than 1/3 of the blade height.
 2. Remove trash and debris prior to mowing.
 3. Maintenance work required during the Maintenance and Guarantee Period shall include mowing, watering, remedial work, such as repair of eroded areas and reseeding, if required. Provide general clean-up of stakes, strings, and temporary signs. Other work shall be included as maintenance work as necessary, such as additional lawn feeding, grub control, weeding, etc., as deemed required by Contractor in support of their guarantee, or as may be pointed out to Contractor by the Owner's Representative or Landscape Architect during the guarantee period.
 4. Maintenance and Guarantee Period is 90 days, adjusted as follows:
 - a. Maintenance and guarantee period is extended when that period overlaps with the months of November, December, January, February and March; the counting of days pauses November 1 and restarts April 1.

3.16 CONDITION OF GUARANTEE OF LAWN AREAS.

- A. Contractor shall guarantee the lawn areas developed under this Contract to be in vigorous and thriving condition by the end of the guarantee period, free of objectionable quantities of weeds and other undesirable growth. Maximum percentage of scattered bare spots shall not exceed 2% of the final lawn areas, and each bare or dead spot shall not be larger than 3 inches by 3 inches for seeded areas, and shall not be larger than 1 inch by 1 inch for sod, and shall not be larger than one-half-inch wide for sod edges.

3.17 FINAL INSPECTION AND FINAL ACCEPTANCE

- A. Toward the end of the Maintenance and Guarantee Period, establish and give notice, in writing, to the Owner's Representative and Landscape Architect stating the desired date for final inspection.
- B. At time of final inspection, the work shall be in the condition required by the guarantee specified hereinbefore, and shall be placed by Contractor in neatly trimmed condition with all adjacent paved areas cleaned.
- C. If work is accepted at time of final inspection, the guarantee shall be considered fulfilled and terminated and final payment shall be due and payable per General Conditions of the Contract. Should any work need replacement at time of final inspection, the guarantee period shall be continued until such replacement is made and deemed acceptable, and no portion of the final

payment shall become due until after final acceptance.

3.18 EXCLUSIONS FROM GUARANTEE

- A. During the maintenance and guarantee period, damage to the areas not caused by the Contractor shall be excluded from the guarantee. Such damage shall include ruts caused by driving vehicles over lawns, burned mulch, whether accidentally or intentionally burned, excavation and backfill work in areas, and acts of vandalism.
- B. Where evidence of such damage exists, advise owner and Landscape Architect, in writing, stating location of the damage. The Owner's Representative, upon receipt of notice, may order the Contractor to correct the damage at the Owner's expense, or exclude the damaged areas from the guarantee provision and correct the damage by any arrangement deemed by the Owner in its best interest.

END OF SECTION

SECTION 32 93 00 – PLANTS

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. Trees.
2. Shrubs.
3. Ground Cover.
4. Plants & Plant Plugs.
5. Edgings.
6. Mineral Mulch.
7. Geotextile Fabric.
8. Planting & Mulching.
9. Planting Soil.
10. Maintenance & Warranties.

- B. Related Sections Include (names may vary):

1. Division 31 Section "Excavation, Backfilling and Compaction."
2. Division 32 Section "Turf and Grasses"
3. Temporary Soil Erosion and Sedimentation – refer to engineering documents
4. Division 1 Section "Summary"
5. Division 1 Section "Alternates"
6. Division 1 Section "Submittal Procedures"
7. Division 1 Section "Substitutions"

1.3 DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.
- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with ball size not less than sizes indicated and or diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.
- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than sizes indicated and or diameter and depth recommended by ANSI Z60.1 for type and size of plant required.
- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than minimum root spread according to ANSI Z60.1 for type and size of plant required.

- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Duff Layer: The surface layer of native topsoil that is composed of mostly decayed leaves, twigs, and detritus.
- G. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- H. Finish Grade: Elevation of finished surface of planting soil.
- I. Manufactured Topsoil: Soil produced off-site or in-situ by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
 - 1. Manufactured Topsoil may be produced in-situ using native material only if the native material (such as subsoil) is tested for physical and horticultural properties, and it is amended per lab recommendations with compost and/or sand along with other amendments to produce topsoil or planting soil.
- J. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- K. Pests: Living organisms that occur where they are not desired, or that cause damage to plants, animals, or people. These include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- L. Planting Area: Areas to be planted.
- M. Planting Soil: Standardized topsoil; existing, native surface topsoil; existing, in-place surface soil; imported topsoil; or manufactured topsoil that is modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- N. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- O. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- P. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- Q. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
- R. Subsoil: All soil beneath the topsoil layer of the soil profile, and typified by the lack of organic matter and soil organisms.

- S. Surface Soil: Soil that is present at the top layer of the existing soil profile at the Project site. In undisturbed areas, the surface soil is typically topsoil; but in disturbed areas such as urban environments, the surface soil can be subsoil.

1.4 SUBMITTALS - GENERAL

- A. General: Provide each submittal according to the Conditions of the Contract and Division 1 Specification Sections, and as described below.
1. Label each submittal with the Specification number and line-item number(s).
 2. Do not combine submittals from different Sections.
- B. Planting Submittals Tracking List: Submit spreadsheet indicating each submittal required by this Section, labeled by name and Specification line-item number, with columns for each submittal indicating dates of submittals, reviews, and completion of reviews/revisions process.
1. Submit to Owner's Representative no later than three months after project start date, or two months prior to planting, whichever is earlier.
 2. Update and submit monthly during months of preparation, purchasing, planting, maintenance, and close-out.
 3. Provide copies of each correspondence to Project Landscape Architect, ThinkGreen LLC.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, including soils.
1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
 2. Plant Photographs: Include color photographs in 3- by 5-inch print or as high quality digital format of each required species and size of plant material as it will be furnished to the Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.
- B. Product Certificates: For each type of manufactured product, signed by product manufacturer, and complying with the following:
1. Manufacturer's certified analysis for standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Samples: For each of the following:
1. 2 lb of topsoil and planting soil mixes for each soil type tested, in labeled plastic bags.
 2. Organic amendment: duplicate samples of 1 quart.
 3. 2 lb of organic mulch for each color and texture required, in labeled plastic bags.
 4. Mineral mulch: Eight stones of 3 inch diameter and larger sizes, and one-half gallon bag of smaller stones, for each type of mineral mulch, in labeled plastic bags, including full range of color and size.

- D. Qualification Data: For Landscape Installer.
- E. Material Test Reports: For existing surface soil, AND imported topsoil, AND planting soil mixes.
 - 1. Existing Source Soil: 1 material test report for each topsoil type.
 - 2. Imported Topsoil and Planting Soil Mixes: 1 material test report for each 100 cubic yards of material from random samples.
- F. Planting Schedule: Indicating anticipated planting dates for exterior plants, in each area of the site.
 - 1. Submit no later than two months prior to planting.
 - 2. Submit update one week prior to completion of planting markouts.
 - 3. Submit update one week prior to start of planting.
 - 4. Provide copies directly to Project Landscape Architect, ThinkGreen LLC.
- G. Plant Sources: Indicating nursery locations and list of plants supplied by each nursery.
 - 1. Submit, in writing, a plant list outlining the source for all plants, their estimated delivery date, and length of time plants are to be stored at an off-site location.
 - 2. Provide a copy directly to Project Landscape Architect, ThinkGreen LLC.
- H. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of exterior plants during a calendar year. Submit before expiration of required maintenance periods.
- I. Plant Substitutions Requests: Plant substitutions will be permitted only upon written approval by the Owner's Rep and/or their designee, using input from Project Landscape Architect.
 - 1. Submit no later than one month prior to anticipated purchasing.
 - 2. Provide a copy directly to Project Landscape Architect, ThinkGreen LLC.

1.6 INFORMATIONAL SUBMITTALS

- A. Warranty: Sample of special warranty.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network, the American Nursery and Landscape Association and or have landscape installation credentials to be reviewed by Owner's Representative.
 - 2. Experience: Five years' experience in landscape installation in addition to requirements in Division 01 Section "Quality Requirements."
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Certified Landscape Technician - Exterior, with installation, maintenance and irrigation specialty area(s), designated CLT-Exterior.

- b. Certified Landscape Technician - Interior, designated CLT-Interior.
 - c. Certified Ornamental Landscape Professional, designated COLP.
- 5. Pesticide Applicator: State licensed, commercial.
- B. Soil-Testing Laboratory Qualifications: An independent or university laboratory, recognized by the State Department of Agriculture, with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed.
- C. Certificates: Provide certificates required by authorities having jurisdiction, including any composted materials containing sewage sludge. Approval as EPA Type 1 "exceptional quality" is required as well as well standards for application of composted organic materials by the Commonwealth of New Jersey.
- D. Sources for Soil Components and Planting Soil Mixes: Submit information identifying sources for all soil components and the contractor responsible for mixing of planting soil mixes.
 - 1. Owner or Owner's Representative shall have the right to reject any soil supplier.
 - 2. Soil mix supplier shall have a minimum of five years experience at supplying custom planting soil mixes.
 - 3. Submit supplier name, address, telephone and fax numbers and contact name. The soil scientist can assist in locating acceptable suppliers within the area.
 - 4. Submit certification that the accepted supplier is able to provide sufficient quantities of materials and mixes for the entire project. Indicate quantity and type of material from each supplier.
- E. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by a qualified soil-testing laboratory stating percentages of organic matter; gradation of sand, silt, and clay content; cation exchange capacity; sodium absorption ratio; deleterious material; pH; and mineral and plant-nutrient content of the soil.
 - 1. Testing methods and written recommendations shall comply with USDA's Handbook No. 60.
 - 2. The soil-testing laboratory shall oversee soil sampling; with depth, location, and number of samples to be taken per instructions from Architect. A minimum of three representative samples shall be taken from varied locations for each soil to be used or amended for planting purposes.
 - 3. Report suitability of tested soil for plant growth – native trees, shrubs and perennials.
 - a. Based upon the test results, state recommendations for soil treatments and soil amendments to be incorporated. State recommendations in weight per 1000 sq. ft. or volume per cu. yd. for nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce satisfactory planting soil suitable for healthy, viable plants.
 - b. Report presence of problem salts, minerals, or heavy metals, including aluminum, arsenic, barium, cadmium, chromium, cobalt, lead, lithium, and vanadium. If such problem materials are present, provide additional recommendations for corrective action.
 - 4. Refer to Section 329200 Turf and Grasses for additional requirements.
- F. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1., "American Standard for Nursery Stock."
 - 1. Selection of plants will be made by the Owner's Representative, who will tag plants at their place of growth before they are prepared for transplanting.

- G. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrub Measurements: Measure according to ANSI Z60.1 with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Take height measurements from or near the top of the root flare for field-grown stock and container grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches above the root flare for trees up to 4-inch caliper size, and 12 inches above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- H. Plant Material Observation: Owner's Representative may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect retains right to observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and to reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Tree tagging with Owner's Representative at Nursery locations is required with three days notice minimum.
 2. Notify Owner's Representative of sources of planting materials seven days in advance of delivery to site.
- I. Preinstallation Conference: Conduct conference at project site to review planting intent with Owner's Representative.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. The Contractor shall contact the Owner's Representative 24 hours prior to the delivery of any plant material.
- B. The Contractor is responsible for having the planting plan, grading plan, plant list, and all applicable installation details on site at all times so that it can be reviewed by the Owner's Representative.
- C. Plant material shall be inspected by the Owner's Representative at the job site upon delivery. Only plants approved by the Owner's Representative shall be stored or planted. The Owner's Representative reserves the right to refuse plant material they deem unacceptable. Rejected plant materials shall be removed from the job site on the day of rejection.
- D. Each tree, shrub, groundcover flat, container of fertilizer or other construction material shall be labeled by grower or manufacturer as separate items.
1. Plant identification labels shall be durable and waterproof. Labels shall be securely attached to plants, bundlers, or containers of plants and shall state the correct botanical plant name and size. Labels shall not be removed from the plants until final acceptance.
- E. Bulk deliveries of mulch, topsoil, and inert material shall be accompanied with delivery tickets showing weight, origin, and composition and stored in such a manner as to prevent the inclusion of foreign materials.
- F. Plant Storage: Trees, shrubs, and groundcovers not installed on the day of delivery to the site shall be stored and protected.
1. No plants shall be stored on the site for a period greater than 5 business days.

2. Storage locations shall be continually shaded and protected from the wind.
 3. Plants stored on the project site shall be protected from drying at all times by covering the balls or roots with moist woodchips, shredded bark, peat moss or other suitable heel-in material.
 4. If planting is delayed more than six hours after delivery, protect from weather and mechanical damage, and keep roots moist.
 5. Do not remove container-grown stock from containers before time of planting.
 6. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly-wet condition.
- G. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of conformance with state and federal laws if applicable.
- H. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 3. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.
- I. Deliver plants freshly dug.
- J. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- K. Handle planting stock by root ball.
- L. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F until planting.
- 1.9 PROJECT CONDITIONS
- A. Planting areas shall be free of waste or debris developed by other trades. Any discrepancy from such conditions shall be reported to the Owner's Representative before beginning any installation.
- B. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- C. Interruption of Existing Services or Utilities: Do not interrupt services or utilities to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary services or utilities according to requirements indicated:

1. Notify Architect no fewer than five days in advance of proposed interruption of each service or utility.
 2. Do not proceed with interruption of services or utilities without Architect's/Owner's written permission.
- D. No plants are to be planted when the ground is frozen or during days of extreme heat (≥ 80 degrees). No plants shall be installed before March 1st or after the ground freezes.
1. If work must be performed outside of these parameters, the Owner's Representative must be contacted.
- E. Planting Restrictions: Within the limitations stated above, plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.
1. Trees and Shrubs:
 - a. Spring Planting: March 1 to May 1
 - b. Fall Planting: September 1 to November 1
 2. Plugs and Herbaceous Plants
 - a. Spring Planting: March 1 to May 1
 - b. Fall Planting: September 1 to October 15
 3. Bulbs
 - a. Fall Planting: September 1 to October 15
 4. Contractor shall schedule tree selection and digging operations so as to comply with nursery industry recognition of 'Spring Dig Only' or 'Fall Hazard' plant materials. No substitutions of plant materials will be allowed for fall planting based on unavailability due to 'Spring Dig Only' or 'Fall Hazard' restrictions.
- F. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.
- G. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.
1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.10 ACCEPTANCE

- A. Conditions at end of Maintenance Period: If plant material is reviewed when it is in full leaf, leaves shall be plump with water with a shape indicative of the species and shall be free of insect, pest and disease damage. Twigs shall have living cambium for their full length. Twigs and branches shall have a full bud set for their full length, including terminal buds. Trunks and branches shall be free of frost cracks, sunscald, damage due to insect, pests and disease, structural defects, and damage resulting from machinery or tools. Plant materials inspected and reviewed when the plants are not in full leaf shall have twigs, branches and trunks meeting the above requirements. All plants regardless of the season of review shall have a minimum of 75 percent healthy, balanced branching structure with a healthy terminal leader(s) with viable terminal bud(s).
- B. If any number of plants do not meet these Acceptance Standards at the time of inspection, or if in the Owner's Representative's opinion, workmanship is unacceptable, written notice will be given by the Owner's Representative to the Contractor in the form of a punch list, which

itemizes necessary planting replacements and/or other deficiencies to be remedied. The Contractor's responsibility for maintenance of all plants shall be extended until replacements are made or other deficiencies are corrected. Plants that do meet these Acceptance Standards shall be removed from the project within seven days of receipt of punch list. Replacements shall conform in all respects to the Specifications for new plants and shall be planted in the same manner.

- C. Following the correction of all punch list deficiencies, the Contractor shall request in writing that the Owner's Representative formally inspect the planting work. If plant materials and workmanship are acceptable, the Owner's Representative will issue a written acceptance and date of Substantial Completion.

1.11 WARRANTY

- A. Special Warranty: Installer agrees to warrant, repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner, or incidents that are beyond Contractor's control.
 - b. Structural failures including plantings falling or blowing over.
2. Warranty Periods begin from Date of Substantial Completion:
 - a. Refer to Establishment Period article in this Specification.
3. Include the following remedial actions as a minimum:
 - a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
 - b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
 - c. A limit of one replacement of each plant will be required except for losses or replacements due to failure to comply with requirements.
 - d. Provide extended warranty for period equal to original warranty period, for replaced plant material.
4. Exclusions from Warranty: Where evidence exists of damage that is beyond the control of the Landscape Contractor, advise Owner's Representative in writing, stating location and nature of Damage. The Owner's Representative, upon receipt of such notice, may order the Landscape Contractor to correct the damage at Owner's expense, or exclude the damaged areas from the warranty and correct the damage by any arrangement deemed appropriate by the owner.

1.12 MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period: up to the end of the Establishment Period.

- B. Ground Cover and Plants: Maintain for the following maintenance period by watering, weeding the plants, fertilizing, and other operations required to establish healthy, viable plantings.
 - 1. Maintenance Period: up to the end of the Establishment Period.
- C. Watering: Review watering needs, temporary establishment irrigation system operations, and weather conditions with Owner.
- D. During the Maintenance Period, any decline in the condition of plantings shall require the contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturists to inspect plant materials, identify problems, and recommend corrective measures. The Owner's Representative shall be notified immediately of such actions.
- E. If Owner chooses to perform all or part of the maintenance during the warranty period, submit maintenance instructions to be performed by the owner and set up a schedule for regular on-site review to assure compliance. Submit instructions and schedule before date of Substantial Completion.
 - 1. Owner's performance of maintenance during the warranty period shall not limit Contractor's obligations under provisions of the warranty.

1.13 CHEMICAL SPRAYING PROGRAM

- A. Follow requirements as specified in Section 329200 Turf and Grasses.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant Schedule or Plant Legend shown on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
 - 1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots will be rejected.
 - 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant as shown on Drawings.
- E. If formal arrangements or consecutive order of plants is shown on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-Stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, complying with ANSI Z60.1
 - 1. Provide balled and burlapped trees.
- B. Small Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:
 - 1. Stem Form: Single stem or, as indicated, multistem, with multiple stems.
 - 2. Provide balled and burlapped trees.
- C. Multistem Trees: Branched or pruned naturally according to species and type, with relationship of caliper, height, and branching according to ANSI Z60.1; stem form as follows:
 - 1. Stem Form: Clump and shrub unless otherwise indicated.
 - 2. Provide balled and burlapped trees.
- D. Herbaceous Plants: according to ANSI Z60.1.

2.3 DECIDUOUS SHRUBS & EVERGREEN SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
 - 1. Provide balled and burlapped or, if indicated or allowed, container-grown shrubs.

2.4 GROUND COVER PLANTS

- A. Ground Cover: Provide ground cover of species indicated, established and well rooted in pots or similar containers, and complying with ANSI Z60.1.

2.5 ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 1/2-inch sieve; soluble salt content of 2 to 5 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:
 - 1. Organic Matter Content: 25 -55% percent of dry weight.

2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, debris, and material harmful to plant growth.

2.6 FERTILIZERS

- A. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 1 percent nitrogen and 10 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 1. Composition: 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight. Follow soil test requirements.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- D. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
 2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.
- E. Planting Tablets: Tightly compressed chip type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.
 1. Size: 5-gram tablets.
 2. Nutrient Composition: 20 percent nitrogen, 10 percent phosphorous, and 5 percent potassium, by weight plus micronutrients.
- F. Chelated Iron: Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

2.7 PLANTING SOILS

- A. Planting Soil (not for tree pits and suspended paving system) - Use local, native planting soil: ASTM D 5268 topsoil, with pH range of 6 to 7.5, a minimum of 10 percent organic material content (by weight) and a maximum of 20 percent; free of stones 1/2 inch or larger in any dimension and other extraneous materials harmful to plant growth. Mix ASTM D 5268 topsoil with the following soil amendments and fertilizers in the following quantities to produce planting soil as recommended by required soil tests.

1. Ratio of Loose Compost to Topsoil by Volume: per required soil tests and recommendations.
 2. Weight of Bonemeal per required soil tests and recommendations.
 3. Weight of Superphosphate per required soil tests and recommendations.
 4. Weight of Commercial Fertilizer per required soil tests and recommendations.
 5. Weight of Slow-Release Fertilizer per required soil tests and recommendations.
- B. Supplement Planting Soil with imported planting soil when quantities are insufficient, meeting planting soil requirements herein.
- C. Planting Soil for Tree Pits and Suspended Paving System Cells: Imported manufactured planting soil conforming to requirements herein, however refer to further requirements indicated on Drawings, and utilize Loam or Sandy Loam.

2.8 MULCHES

- A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, subject to approval of Owner's Representative, consisting of the following:
1. Type: Triple Shredded hardwood.
 2. Size Range: 3 inches maximum, 1/2 inch minimum.
 3. Color: Natural.
- B. Mineral Mulch (Riverstone): Free from deleterious materials, consisting of the following:
1. Color: Gray-beige range typical of regional sources.
 2. Size Ranges: 1" to 3" diameter unless otherwise indicated on Drawings.
 3. Product: naturally-rounded stones.

2.9 STAKING & GUYING:

- A. Tree stakes shall be two 2"x2" stakes, a minimum of 6 feet long with 2 feet in ground. Guying shall consist of nylon straps wrapped loosely around the trunk.

2.10 NON-WOVEN GEOTEXTILE FABRIC:

- A. Mirafi 140N or approved equal

2.11 EDGE RESTRAINTS:

- A. At drip strip: as indicated, or approved equal.
- B. At planting bed edge interface with lawn: same product as indicated for drip strip, or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive plants for compliance with requirements and conditions affecting installation and performance.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Do not mix or place soils and soil amendments in frozen, wet, or muddy conditions.
 - 3. Suspend soil spreading, grading, and tilling operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 4. Uniformly moisten excessively dry soil that is not workable and which is too dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Lay out individual tree, shrub, plant locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Owner's Representative's acceptance of layout before excavating or planting. Make minor adjustments as required. Notify Owner's Representative three days prior to layout and staking.
- D. Lay out plants at locations directed by Owner's Representative. Stake locations of individual trees and shrubs and outline areas for multiple plantings. Notify Owner's Representative three days prior to layout and staking.

3.3 PLANTING AREA ESTABLISHMENT

- A. Prior to commencing any finished grading, the Contractor shall notify the Owner's Representative allowing enough time for a thorough inspection of the subgrade.
- B. Perform all finished grading necessary to bring site to required finished elevations indicated on the grading plan and to allow for positive drainage.
- C. Use topsoil stockpiled on the site during earthwork operations and provide any additional topsoil required. Refer to Section 329200 Turf and Grasses for additional requirements.
- D. Topsoil shall not be placed when the subgrade is frozen, excessively wet, or extremely dry, and no topsoil shall be handled when in a frozen or muddy condition.
- E. Loosen subgrade of planting areas to a minimum depth of 12 inches after spreading 1" of compost and blending into subgrade (not applicable to plug areas – see Section 329200 for

loosening in those areas). Remove stones larger than 1/2 inch in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer as directed or required by soil tests directly to subgrade before loosening.
 2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer as directed or required by soil tests on surface, and thoroughly blend planting soil.
 - a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
 3. Spread planting soil to a depth of 12 inches at trees, shrubs and herbaceous plants but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
 - a. Spread approximately one-half the thickness of planting soil over loosened subgrade. Mix thoroughly into top 8 inches of subgrade. Spread remainder of planting soil.
- F. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- G. After completion of topsoil placing and approval of finish grading by the Owner's Representative, remove any excess topsoil from the site and deliver to location determined by the Owner's Representative.
- H. Leave finish graded area clean, well raked, and ready for planting.
- I. Before planting, restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PLANTING LAYOUT:

- A. Layout of plants prior to planting shall be verified by the Owner's Representative. Any alterations to the planned planting layout must be approved by the Owner's Representative and/or their designee.

3.5 EXCAVATION FOR TREES AND SHRUBS

- A. Planting Pits and Trenches: Excavate circular planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are not acceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
1. Excavate approximately three times as wide as ball diameter for balled and burlapped, balled and potted, container-grown stock.
 2. Excavate at least 12 inches wider than root spread and deep enough to accommodate vertical roots for bare-root stock.
 3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
 4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.

5. Maintain required angles of repose of adjacent materials as shown on the Drawings. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
 6. Maintain supervision of excavations during working hours.
 7. Keep excavations covered or otherwise protected overnight, after working hours and when unattended by Installer's personnel.
 8. If drain tile is shown on Drawings or required under planting areas, excavate to top of porous backfill over tile.
- B. Topsoil removed from excavations may be used as planting soil if it meets the requirements recommended by the soil tests.
- C. Obstructions: Notify Owner's Representative if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations, or if hardpan is encountered.
- D. If an impervious, hard pan layer remains in the bottom of the pit after excavation the Owner's Representative shall be notified prior to any additional planting activities to inspect the excavation and develop an alternate course of action. The Owner's Representative may recommend the following action in item 1 below:
1. Hardpan Layer: Drill 6-inch- diameter holes, 24 inches apart, into free-draining strata or to a depth of 10 feet , whichever is less, and backfill with free-draining material.
 2. Refer to Section 329200 Turf and Grasses for 3.2.D for required treatment in hardpan areas that is also required in planting areas if the general area is hard pan.
- E. Drainage: Notify Owner's Representative if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.
- F. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.6 TREE AND SHRUB PLANTING

- A. Before planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.
- C. Set balled and burlapped stock plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.
1. Use local, native planting soil that meets the soil test requirements in planting areas shown on landscape plans for backfill, or use Planting Soil.
 2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.

4. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 3 inches from root tips; do not place tablets in bottom of the hole.
 5. Continue backfilling process. Water again after placing and tamping final layer of soil.
- D. Set potted and container-grown stock plumb and in center of planting pit or trench with tree root flares 2 inches above adjacent finish grades, and shrub root flares 1" above adjacent finish grades or flush with adjacent finish grades.
1. Use local, native planting soil that meets the soil test requirements for planting soil, or use planting soil.
 2. Carefully remove root ball from container without damaging root ball or plant
 3. Cut root ball vertically at three or four locations to cut girdling roots, approximately 1" deep and as required to cut girdling roots.
 4. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
 5. Place planting tablets in each planting pit when pit is approximately one-half filled; in amounts recommended in soil reports from soil-testing laboratory. Place tablets beside the root ball about 3 inches from root tips; do not place tablets in bottom of the hole.
 6. Continue backfilling process. Water again after placing and tamping final layer of soil.
- E. When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.7 GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Landscape Plans & Details. Notify Owner's Representative three days prior to layout and staking.
- B. Use local, native planting soil that meets the soil test requirements for planting soil, or use planting soil.
- C. Dig holes large enough to allow spreading of roots.
- D. Gently break up roots of any root-bound plants.
- E. For rooted cutting plants supplied in flats, plant each in a manner that will minimally disturb the root system but to a depth not less than two nodes.
- F. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- G. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- H. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.8 STAKING AND GUYING:

- A. Staking and guying shall be done immediately after trees are planted using specified staking materials.
- B. Trees shall stand plumb prior to staking.

3.9 PLANTING AREA MULCHING

- A. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Tree-like Shrubs in Turf Areas: Apply organic mulch ring of 2-inch to 3-inch average settled thickness, with 36-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 2-inch to 3-inch average settled thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

3.10 PLANT MAINTENANCE

- A. The Contractor shall be responsible for providing the following maintenance on all newly planted trees, shrubs, groundcovers, and herbaceous perennials.
 - 1. Watering: During any 7 day period that yields less than 1/2 inch of rainfall - as measured by a nearby Weather Service station - the contractor shall water all plant material to maintain a constant suitable moisture level for adequate plant growth. The Contractor shall be responsible for providing all watering hoses, watering devices or other water delivery methods including tankers. The Owner will provide the water source.
 - 2. Insect, Disease, and Weed Control: Weed control shall be by mechanical or hand weeding. The use of herbicides, insecticides, fungicides, nematicides, fumigants or other chemicals are only acceptable upon approval by the Owner under the provisions of a Chemical Spraying Program approved by the Owner's Representative.
- B. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings. Spray or treat as required to keep trees and shrubs free of insects and disease.
- C. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- D. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.11 ESTABLISHMENT PERIOD

- A. The Establishment Period will begin upon notice of substantial completion by the Contractor and inspection by the Owner's Representative and will last for a total of 365 days.
- B. Plants shall be guaranteed during the Establishment Period and shall be alive and in satisfactory growth at the end of that period. Plants which die within the establishment period will be removed by the Contractor within five (5) business days of notice or the Owner will

remove the plants and bill the Contractor accordingly. Replacement plants may be installed during the next appropriate planting season for the species specified. All replacements shall be plants of the same species and size specified in the plant list. They shall be furnished and planted according to all previous specifications noted and shall be guaranteed through an additional 365 days, as outlined above. The cost of replacement shall be borne by the Contractor, except for possible replacements resulting from removal, loss or damage due to vandalism, or act of neglect on the part of others.

- C. The Contractor is responsible for all maintenance activities, including watering, weeding, insect and disease control or other methods required to insure the overall health of the plants during the Establishment Period.

3.12 FINAL INSPECTION AND ACCEPTANCE:

- A. At the end of the Establishment Period, an inspection will be made by the Owner's Representative and the Contractor. Any plant determined to be of insufficient quality or unsatisfactory growth, as determined the Owner's Representative, shall be removed from the site and replaced at the Contractor's expense.

3.13 RIVERSTONE, METAL EDGE RESTRAINT, AND FABRIC INSTALLATION AT DRIP STRIPS

- A. Verify finish grades and review with Architect on site.
- B. Excavate to depth required.
- C. Compact soil under the drip strip.
- D. Install edge restraint according to manufacturer's instructions.
 - 1. Tolerance: maximum 1/4" horizontal variance in 20 linear feet, and 1/2" in 50 linear feet.
 - 2. Utilize full-length pieces wherever possible.
- E. Install nonwoven geotextile fabric per manufacturer's instructions.
 - 1. Overlap fabric 12" minimum: lay uphill fabric over downhill fabric and install one u-shaped stake at each overlap.
 - 2. Wrap fabric up the face of edging and wall, trim cleanly 1 inch below top of edge restraint and below top of riverstone.
- F. Place riverstone and rake riverstone to settle small stones into larger stones, to meet settled depth indicated on Drawings.

3.14 CLEANUP AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition.
- B. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- C. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

3.15 DISPOSAL

- A. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally recycle or dispose of them off Owner's property.

END OF SECTION 329300

SECTION 32 93 01 – TREE TRANSPLANTING

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 requirements for transplanting trees, shrubs and perennials including grasses.
- B. Related Sections Include (names and numbers may vary):
 - 1. Division 1 Section "Summary"
 - 2. Division 1 Section "Alternates"
 - 3. Division 1 Section "Submittal Procedures"
 - 4. Division 1 Section "Substitutions"
 - 5. Division 32 Section "Turf and Grasses"
 - 6. Division 32 Section "Plants"

1.3 SUMMARY

- A. Section includes requirements for transplanting trees and shrubs.

1.4 SUBMITTALS

- A. Follow requirements in Division 32 Section "Plants."
 - 1. Expedite submittals for transplanting work to begin at the start of the Contract.
- B. Planting Schedule: Indicating anticipated planting dates for transplanting trees including:
 - 1. Time of year for transplanting.
 - 2. Transplanting methods.
 - 3. Follow-up care and maintenance.
- C. Maintenance Instructions: Include maintenance instructions for transplanted trees and shrubs in the submittal for Division 32 Section "Plants".

1.5 QUALITY ASSURANCE

- A. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Topsoil Analysis: Refer to Division 32 Sections "Turf and Grasses" and "Plants"

- C. Pre-installation Conference: Conduct conference at Project site with installer and Landscape Architect present.
- D. Pruning: Follow ANSI 300 Pruning Standards.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Light pruning for trees and shrubs is recommended as indicated herein.
- B. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees in such a manner as to destroy their natural shape. Do not drop during delivery and handling.
- C. Handle planting stock by root ball.
- D. Move plants after preparations for the planting pits have been completed and install plants immediately after digging out of their existing locations. If planting is delayed more than one hour, park tree spade with tree in shade, set potted and balled-and-burlapped plants in shade, protect from weather and mechanical damage, and keep roots moist.

1.7 SEQUENCING AND SCHEDULING

- A. Proceed with transplanting before selective site demolition begins at the existing plants.
- B. Mark out existing utilities and proposed utility routes; mark out proposed pavement edges near proposed planting; stake proposed planting locations for review with Landscape Architect.
- C. Provide root pruning one month minimum prior to moving plants; begin root pruning activities shortly after the Contact's notice to proceed; review with Landscape Architect.
- D. Complete soil testing and planting soil preparation for soils at proposed planting areas prior to transplanting, or if not feasible due to timing, then as follows:
 - 1. Prepare planting areas by mixing in 10 percent compost into the existing soil to a depth of 12 inches, for an area of 36 inches beyond tree trunks and an area of 24 inches beyond shrub trunks.
 - 2. After soil testing is completed, proceed with adding amendments per lab recommendations for native plants.
- E. Dig and plant plants during cool weather. Avoid moving plants on very hot, dry, or windy days.
- F. Water existing plants in the days prior to the transplanting.
- G. Proceed and coordinate work with the site demolition work, and consistent with seasonal limitations for transplanting.
 - 1. If the timing of the Contract and work sequence does not allow time for transplanting, then purchase and plant new plants as indicated on Drawings at no additional cost to the Owner, and in conformance with Division 32 Section "Plants".

2. Follow planting restriction dates specified in Division 32 Section "Plants".

1.8 FINAL ACCEPTANCE

- A. Follow requirements in Division 32 Section "Plants".

1.9 WARRANTY

- A. Follow requirements in Division 32 Section "Plants".

1.10 MAINTENANCE SERVICE

- A. Follow requirements in Division 32 Section "Plants".

1.11 DEFINITIONS

- A. Owner: Montgomery County, PA
- B. Owner's Representative: Project Manager or Project Management Company employed by the Owner. The Owner may delegate specific Owner's Representative responsibilities to the Architect, Landscape Architect and Engineer.

1.12 PRUNING OF TREES AND SHRUBS

- A. Follow ANSI A300 standards.
- B. Branch pruning and root pruning shall be by Contractor's Arborist or under Contractor's Arborist's constant supervision; refer to Division 01 Section "Tree Protection and Trimming" for Arborist qualifications applicable to this Section.
 1. Notify Landscape Architect when root pruning occurs.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

- A. General: Salvage trees, shrubs and perennials as indicated.
- B. Root-Ball Depth: Salvage trees and shrubs with root balls measured from top of root ball, which shall begin at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- C. Transplanted Trees: tree-spade-dug trees that are moved immediately into pre-dug holes, or balled-and-burlapped trees that are moved to holes within one hour.

2.2 FERTILIZER

- A. Meet requirements in Division 32 Section “Plants” based on soil tests for each soil type.

2.3 PEST CONTROL AND PLANT TREATMENTS

- A. Meet requirements in Division 32 Section “Plants.”

2.4 MULCHES

- A. Meet requirements in Division 32 Section “Plants.”

2.5 PLANTING SOIL

- A. Meet requirements in Division 32 Section “Plants.”

2.6 SOIL TREATMENT

- A. “Total Installation” Transplant Concentrate and Plant Enhancer as manufactured by BioPlex, or approved equal.

2.7 LEAF TREATMENT

- A. One of the following products, or approved equal:
 - 1. Wilt-Pruf manufactured by Wilt-Pruf Products Inc
 - 2. Bonide Wilt Stop manufactured by Bonide Products, Inc.
 - 3. Transfilm, manufactured by Miller Chemical & Fertilizer, LLC.

2.8 TRANSPLANT PROTECTION FENCE

- A. 6-foot high chain link fence, with weighted feet.
- B. Secure panels together with hardware, and use 8-foot minimum posts driven into the ground 2-foot minimum at ends of each run, to prevent moving and blowdown.

2.9 PLANTING SOIL

- A. Meet requirements in Division 32 Section “Plants.”

2.10 EQUIPMENT

- A. Pruning Tools: Use only sharp, clean tools, sterilized prior to use.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Verify with Landscape Architect the plants to be transplanted prior to beginning work.
- B. Root prune trees and shrubs at least one month prior to transplanting and as recommended by Contractor's Arborist; this requirement may be waived by Landscape Architect if the schedule does not allow it.
- C. Stake plant layout for adjustment and approval prior to transplanting – follow requirements in Division 32 Section "Plants".
- D. Transplant to locations as shown on Drawings and as approved by Landscape Architect. Proceed with transplanting operations based upon schedule accepted by Landscape Architect.
- E. Crown Pruning: Upon award of contract, prune trees and shrubs back about 10% to 30%. Prune side branches only. Do not cut leaders of trees with leaders.
- F. Remove weeds and weed roots from proposed planting areas.

3.2 SALVAGING OF TREES

- A. Do not excavate tree pits more than 24 hours prior to transplanting.
- B. Cut and remove all vines and underbrush from the trunk and branches of the tree to facilitate access by machine, but do not damage existing plants to remain. Remove weeds and weed roots.
- C. Treat leaves with Leaf Treatment prior to transplanting, if plants are in leaf.
- D. Hand-dig and provide balled and burlapped root balls meeting root ball sizes of ANSI Z60.1 plus 12 inches, or larger if required herein and as required for successful transplantation and healthy plant growth.
- E. Immediately backfill holes where plants were removed.
- F. Transport trees to contractor's nursery property and provide automatic irrigation and provide plant care. Untie the branches while the tree is in the nursery, and re-tie before final transport to the site. Provide 3-inches mulch on the root balls (keep away from trunks), and surround the root balls with mulch or wood chips.
- G. Transport back to the project site when the planting locations are ready for planting; continue temporary watering until planted.
- H. Plant per Division 32 Section "Plants" and as indicated.

- I. Install 20-gallon tree watering bags at single-stem trees, and 15-gallon watering bags at shrubs and multistem trees.
- J. Provide frequent periodic watering for a minimum of two months to prevent soil from drying out, and as further required in Division 32 Section "Plants" for healthy plant growth and establishment

3.3 STAKING

- A. Transplanted trees, including understory trees, require staking; refer to Division 32 Section "Plants".

3.4 INSTALLING TRANSPLANT PROTECTION FENCE

- A. Install transplant protection fence as soon as feasible after transplanting.
- B. Surround the trees with fencing to prevent damage to plants and root balls.

3.5 EROSION AND SEDIMENTATION CONTROL

- A. Meet requirements of Erosion and Sedimentation Control Drawings and Specification.
 - 1. If overall project's controls are not yet installed at the time of transplanting, then provide temporary controls and mulching at no additional cost to the Owner.

3.6 PLANT MAINTENANCE

- A. As required in Division 32 Section "Plants" and herein.
- B. Protect exterior plants from damage due to landscape operations, operations by other contractors and trades, and others. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

3.7 FIELD QUALITY CONTROL

- A. Follow requirements of Division 32 Section "Plants."

3.8 CLEANUP

- A. Remove Transplant Protection Fencing after grading, utility and hardscape work is complete.
- B. Dispose debris legally off-site.
- C. Clean all areas as required for complete and acceptable inspection, and as required in Division 32 Section "Plants."

END OF SECTION

SECTION 32 94 51 – SOIL CELLS

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes materials and installation of soil cells, specifically the R-Tank UrbanForest system (hereafter called UrbanForest); drawings refer to this work as Suspended Paving System and/or Soil Cells.
- B. Materials installed but not specified in this Section include but are not limited to manufactured planting soil (for tree pits and suspended paving system), as indicated on Drawings and complying with Division 32 Section "Plants".

1.03 REFERENCES

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- B. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
- C. ASTM F2418 - Standard Specification for Polypropylene (PP) Corrugated Wall Stormwater Collection Chambers.
- D. Manufacturer's product literature and guidelines for UrbanForest product.

1.04 QUALITY CONTROL

- A. Manufacturer Qualifications: The UrbanForest units shall be supplied by Ferguson Waterworks, or approved equal, and manufactured in ISO certified facilities.
 - 1. Manufacturer samples shall be provided to the Owner's Representative & Contractor for review upon request.
 - 2. A manufacturer's technical assistance representative (herein identified as "manufacturer's representative") shall be available for pre-installation conference, per article titled Preinstallation Conference, for installer training, and for periodic review during construction.
- B. Installer Qualifications: Installation shall be performed by an installer experienced in the installation of soil cells or modular stormwater storage units.
 - 1. A minimum of three equivalent projects completed within 2 years; and,
 - 2. A minimum of 25,000 cubic feet of soil or stormwater storage volume completed within last 5 years.
 - 3. Installer experience requirement may be waived, upon written approval of Landscape Architect, if the manufacturer's representative provides on-site training and regular review during construction, at no additional cost to Owner.
 - 4. Installer shall demonstrate knowledge and experience in the installation of subsurface storage system or subsurface soil cells system. Work shall be performed only by skilled workers with experience in bulk earthworks, pipe, chamber, soil cell, or pond/landfill construction projects of comparable size and quality.

1.05 SUBMITTALS

- A. Installer qualifications indicating compliance with requirements in article 1.04 B.
- B. Product data, installation guidelines, and layout shop drawings for the UrbanForest units, as follows:
 - 1. UrbanForest layout shop drawings, including plan and cross sections based on project requirements and adjacencies; including details as well as the required base elevation of stone and soil cells; including minimum cover requirements and including soil cell configuration.
 - a. In layout shop drawings include nearby existing utilities and proposed utilities, at actual depths and diameters, and indicating minimum bedding requirements per project civil engineering requirements and per utility company requirements; include bridging details where required.
 - 2. UrbanForest product data, including compressive strength, and installation guidelines.
 - 3. Accessory material documentation for geotextile, geogrid, base course and backfill materials.
- C. Any proposed "Equal" alternative product substitution to this specification **must be submitted for review and approved prior to bid opening**. Review Package shall include third party reviewed performance data that meets or exceeds criteria in Table 2.01 B; Review Package shall also include product data and typical cross sections. Follow requirements Division 1 Specification "Substitutions."
 - 1. "Equal" status review additionally will consider that soil cells width must be between 30 inches and 31 inches wide due to site constraints, and must be able to handle H-20 loading with 12" minimum cover.
 - 2. Review will be by project Landscape Architect, ThinkGreen LLC.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect UrbanForest material and other materials from damage during delivery and offloading. Handling is to be performed with equipment appropriate to the materials and site conditions.
- B. Storage of materials should be on smooth surfaces, free from dirt, mud and debris, and away from any open flame, welding operations, or other potential heat sources. UV sensitive materials and UrbanForest units should be stored under a tarp to protect from sunlight when time from delivery to installation exceeds two weeks.
- C. When handling and installing product in cold weather:
 - 1. When the air temperature is 40° F or below, care must be taken when handling plastics to ensure no cracking. Do not use frozen materials, or materials coated with ice or frost.
 - 2. Do not build on frozen ground or wet, saturated or muddy subgrade.

1.07 PREINSTALLATION CONFERENCE.

- A. Prior to the start of the installation, conduct a pre-installation conference with the representatives from the Civil Engineer, Landscape Architect, Architect, general contractor, excavation subcontractor, UrbanForest installer, paving installer, and manufacturer's representative.
- B. During the pre-installation conference, review the layout drawings and discuss key steps of the process.

1.08 PROJECT CONDITIONS

- A. Coordinate installation for the UrbanForest system with other on-site activities to eliminate all non-installation related construction traffic over the completed UrbanForest system.
- B. Protect adjacent work from damage during UrbanForest system installation.
- C. Provide proper sediment controls to prevent sediment intrusion.

- D. Protect work during construction; repair any damage occurring during construction.

PART 2 - PRODUCTS

2.01 URBANFOREST UNITS (SOIL CELL UNITS)

- A. Injection molded plastic tank components assembled to form a modular structure of predesigned height.
- B. UrbanForest units shall meet the following Physical & Chemical Characteristics:

PROPERTY	DESCRIPTION	URBANFOREST VALUE
Void Area	Volume available for water storage	95%
Surface Void Area	Percentage of exterior available for infiltration	90%
Vertical Compressive Strength	ASTM D 2412 / ASTM F 2418	55.0 psi
Lateral Compressive Strength	ASTM D 2412 / ASTM F 2418	12.0 psi
Non-vehicular Minimum Cover	Cover required to support nonvehicular loads	9"
HS-20 Minimum Cover	Cover required to support HS-20 loads	12"
Maximum Cover	Maximum allowable cover depth	< 3 feet

2.02 GEOSYNTHETICS

- A. Geotextile
- Standard Application: The standard geotextile shall be an 8 oz per square yard nonwoven geotextile.
- B. Geogrid
- Include geogrid to reinforce backfill above the UrbanForest system, as indicated.
 - Product: ACF-BX 12 or as otherwise directed by UrbanForest manufacturer representative in writing.

2.03 BEDDING, BACKFILL & COVER MATERIALS

- A. Materials shall be free from lumps, debris, and any sharp objects that could cut the geotextile.
- B. UrbanForest manufacturer requires a minimum 2,000 pounds per square foot bearing capacity for the soil under soil cell units placed directly on soil.

1. Bearing capacity at the bottom of the excavation shall be tested and approved by the Owner's Geotechnical Engineer, prior to placement of fabrics, aggregates and soil cells.
2. Bedding Materials: In cases where the native soil cannot achieve a minimum 2,000 pounds per square foot bearing capacity, as determined by the Owner's Geotechnical Engineer, after contractor's initial excavation, then the Owner's Geotechnical Engineer shall determine the required subbase replacement type, depth and compaction, to achieve acceptable bearing capacity, in collaboration with manufacturer.
 - a. UrbanForest manufacturer recommendation for any bedding material is as follows: "it is recommended that the bedding utilize stone (angular and smaller than 1.5" in diameter) or soil (GW, GP, SW, or SP as classified by the Unified Soil Classification System) below the UrbanForest system (3" minimum and 12" maximum). For infiltration or underdrain applications bedding material shall be free draining."
 - b. Provide nonwoven geotextile between dissimilar materials.
- C. Side and Top Backfill: PennDOT 2B aggregate, clean and free of debris.
 1. Identical backfill material shall be used on the side and top of the units.
- D. Additional Cover Materials: Additional cover material (base aggregate for sidewalk concrete, extending down to the Soil Cell system top backfill) shall be PennDOT 2A aggregate.
 1. Provide the project civil engineer with a submittal for this material, and provide Landscape Architect with a copy of the submittal for this material.
 2. No limestone or crushed concrete.
 3. Place geogrid as indicated, with woven geotextile above the geogrid and nonwoven geotextile below the geogrid as indicated; extend geogrid as indicated and as specified herein.

PART 3- EXECUTION

3.01 EXCAVATION PREPARATION

- A. Verify the site conditions are suitable for product storage and installation. Notify Owner's Representative immediately if conditions are not suitable.
- B. Excavations must meet OSHA safety standards for slopes or shoring; provide materials, labor, means and methods as required to meet OSHA safety standards, at no additional cost to Owner.
- C. Stake out, excavate, and prepare the subgrade area per Owner's Geotechnical Engineer's recommendations and/or as shown on the design drawings, to provide adequate support for project design loads.
 1. Ensure that the excavation is at least 1-foot greater than UrbanForest dimensions in each direction allowing for installation of geotextile filter fabric, UrbanForest units, and backfill materials.
 2. Base of the excavation shall be uniform, level, and free of lumps or debris and soft or yielding subgrade areas.
 3. Unsuitable Soils or Conditions: All questions about the base of the excavation shall be directed to the Owner's Geotechnical Engineer. The Owner's Geotechnical Engineer shall determine the required bearing capacity of the subgrade; however, in no case shall a bearing capacity of less than 2,000 pounds per square foot be provided.
- D. Place a layer of geotextile along the native soil, as indicated. Cut strips to length, and install in excavation, removing wrinkles so material lays flat.
 1. Overlap geotextile a minimum 12" or as recommended by manufacturer if wider. Use tape, special adhesives, sandbags, or other ballast to secure overlaps.
 2. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.

- E. For projects including a bedding layer (Section 2.03B) place the layer within $\frac{1}{2}$ " (+/- $\frac{1}{4}$ ") of level or as shown on the plans. Vibratory tamp or static roll to prepare bedding materials until they are firm and unyielding.

3.02 LAYOUT AND INSTALLATION OF URBANFOREST UNITS

- A. Outline the footprint of the UrbanForest system on the geotextile fabric or bedding layer using spray paint or chalk line to ensure a 1-foot perimeter to ensure a square and straight installation.
- B. Assemble UrbanForest units in accordance with the UrbanForest drawings, installation guidelines, and manufacturer's onsite representative.
- C. Install UrbanForest units by placing side by side, in accordance with the design drawings. The units are to be oriented as indicated with required depth as indicated. Install side panels around the backfill perimeter, except along the tree soil area. Stacking clips shall be installed in each tier and each direction, as shown on design drawing details.
- D. Drape a layer of geotextile fabric along the base of the side backfill and up over the UrbanForest units to prevent backfill entry into the system. Take great care to avoid damage to geotextile during placement.
 - 1. Install the geotextile by cutting strips to length and removing wrinkles so material lays flat.
 - 2. Overlap geotextile a minimum 12" or as recommended by manufacturer if wider. Use tape, special adhesives, sandbags, or other ballast to secure overlaps.
 - 3. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.
- E. Identify any pipe penetration locations. The geotextile fabric shall be cut to enable the pipe penetration and secured using stainless steel pipe clamps. Support pipe during backfill operations to prevent pipe from settling and damaging the geotextile wrap or pipe.
- F. Install drainage pipe, ports, grates, fitting, etc. in locations noted on plans. Support pipe during soil infill placement operations to prevent the pipe from settling. This step may be completed after initial lifts of soil infill placement to prevent the pipe from settling (Article 3.04).

3.03 SIDE BACKFILLING OF THE URBANFOREST UNITS

- A. Backfill with materials as indicated and as specified herein.
 - 1. Place material around the perimeter of the units in lifts with a maximum thickness of 12" (or less if otherwise indicated) and compacted with walk behind compaction equipment.
 - a. Each lift shall be placed around the entire perimeter such that each lift is no more than 24" higher than the side backfill along any other location on the perimeter of the UrbanForest system.
 - b. No fill shall be placed over top of units until the side backfill has been completed.
 - c. Each lift shall be compacted per project specifications or until no further densification is observed (for self-compacting stone materials). Even when "self-compacting" backfill materials are selected, a walk behind vibratory compactor must be used.
 - d. Take care to ensure that the compaction process does not allow the machinery to contact the units due to the potential for damage to the geotextile and units.
 - e. No compaction equipment is permissible to operate directly on the units.

3.04 PLACING SOIL INFILL WITHIN URBANFOREST UNITS

- A. Fold any geotextile fabric installed in Section 3.02 outward, over the side backfill material. This exposes the UrbanForest units for soil infill.
- B. Infill with manufactured planting soil mix in accordance with project specifications.
 - 1. Place material in lifts with a maximum thickness of 12".

2. Walk through, or lightly tamp, the soil infill to remove air pockets and settle the infill material.
 3. Continue placing the soil infill in a similar manner, until reaching the bottom edge of the top platen. Walk through, or lightly tamp, the soil infill to remove air pockets and settle the infill material. The material should be approximately 2" to 3" from the top edge of the UrbanForest unit.
 - a. As noted in Section 3.02F, if not already installed, install the drainage and aeration components prior to the final lift of soil infill.
- C. Install the trees, planting soil within the tree soil area, and root barriers in accordance with suppliers requirements and as specified.

3.05 TOP BACKFILLING OF THE URBANFOREST UNITS

- A. Install the Top Panels onto the top layer of UrbanForest units using the supplied stacking pins. Be sure to cut necessary openings for pipe penetrations.
- B. Fold any draped geotextile fabric back over the Top Panels. Add a layer of geotextile fabric, as needed, over the Top Panel, to ensure complete coverage over the top surface of the UrbanForest units to prevent backfill entry into the system. Take great care to avoid damage to geotextile during placement.
1. Install the geotextile by cutting strips to length and removing wrinkles so material lays flat.
 2. Overlap geotextile a minimum 12" or as recommended by manufacturer. Use tape, special adhesives, sandbags, or other ballast to secure overlaps.
 3. As geotextiles can be damaged by extreme heat, smoking is not permissible on/near the geotextile, and tools using a flame to tack the overlaps, such as propane torches, are prohibited.
- C. Place a top backfill layer on the units to the thickness indicated and in accordance with project specifications.
1. Only low-pressure track vehicles shall be operated over the UrbanForest system during construction. Dump Trucks and Pans shall not be operated within the UrbanForest system footprint at any time. Heavy equipment should unload in an area adjacent to the UrbanForest system and the material should be moved over the system using low ground pressure tracked equipment.
 - a. General Contractor shall communicate this information to the concrete walk installer and to any other trades operating in this area.
 2. Lightly compact using a walk-behind trench roller. Alternately, a roller (maximum gross vehicle weight of 6 tons) may be used. Roller must remain in static mode. Sheep foot rollers should not be used. Communicate this information to the concrete walk installer.
- D. Completely encapsulate the backfill in the specified geotextile. Overlap geotextile 12" or as recommended by manufacturer if wider. Take great care to avoid damage to geotextile (and, if specified, impervious liner) during placement.
- E. Install a geogrid as shown on plans. Geogrid shall extend a minimum of 3 feet beyond the limits of the excavation wall wherever feasible. In cases of limitations such as curb, property line, etc. consult the UrbanForest manufacturer's representative about reducing the minimum extension length.
- F. Following placement and compaction of the initial cover, geogrid and fabrics, subsequent lifts of PennDOT 2A aggregate at concrete sidewalk areas shall be placed and compacted to standard proctor % as specified by Civil Engineer, using equipment and methodology approved by UrbanForest manufacturers representative and written instructions to prevent damage to the UrbanForest soil cells below. Do not exceed maximum cover depths listed in Table 2.01B.

- a. Increase the 4" depth of aggregate indicated under concrete sidewalk, extending down to the geogrid and geotextile layer at the top of the UrbanForest system, as required to accommodate the level UrbanForest system sections and the slope of the sidewalk. Do not exceed maximum cover depths listed in Table 2.01B.

- G. Continue with the installation of the final surface finish as indicated.

- 1. Keep unrelated construction traffic and equipment away from the limits of excavation until the project is complete and final surface materials are in place.

3.06 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by soil cell work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect temporary fencing or barricades and warning signs as required to protect soil cells and finished paving from traffic and construction equipment. Maintain fencing and barricades throughout construction of adjacent areas that require use of heavy equipment.

3.07 END OF SECTION