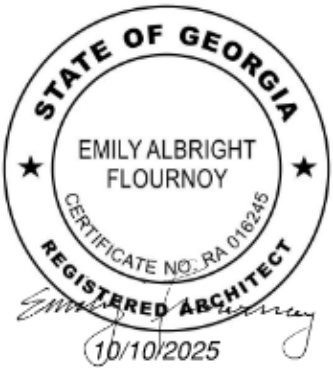
PROJECT MANUAL

TROUP COUNTY FIRE STATION #14

3157 Roanoke Road
Troup County, Georgia



Prepared by
2WR Architects
11 Ninth Street, Suite 120
Columbus, GA 31901

Project Number 24-01977

TABLE OF CONTENTS

DIVISION 04 - MASONRY

04 20 00	UNIT MASONRY

DIVISION 05 - METALS

05 12 00	STRUCTURAL STEEL FRAMING

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

06 00 00	WOODS & PLASTICS
06 10 00	ROUGH CARPENTRY
06 16 00	SHEATHING
06 17 53	SHOP-FABRICATED WOOD TRUSSES
06 41 16	PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

07 14 16	COLD FLUID-APPLIED WATERPROOFING
07 21 00	THERMAL INSULATION
07 21 19	FOAMED-IN-PLACE INSULATION
07 31 13	ASPHALT SHINGLES
07 46 46	FIBER-CEMENT SIDING
07 62 00	SHEET METAL FLASHING AND TRIM
07 71 00	ROOF SPECIALTIES
07 72 00	ROOF ACCESSORIES
07 92 00	JOINT SEALANTS

DIVISION 08 - OPENINGS

08 11 13	HOLLOW METAL DOORS AND FRAMES
08 12 13	HOLLOW METAL FRAMES
08 14 16	FLUSH WOOD DOORS
08 33 23	OVERHEAD COILING DOORS
08 51 13	ALUMINUM WINDOWS
08 71 00	DOOR HARDWARE
08 80 00	GLAZING

DIVISION 09 - FINISHES

09 29 00	GYPSUM BOARD
09 51 23	ACOUSTICAL TILE CEILINGS
09 65 13	RESILIENT BASE AND ACCESSORIES
09 65 19	RESILIENT TILE FLOORING
09 68 13	TILE CARPETING
09 91 14	EXTERIOR PAINTING (MPI STANDARDS)
09 91 24	INTERIOR PAINTING (MPI STANDARDS)
09 93 01	STAINING AND TRANSPARENT FINISHING (MPI STANDARDS)
09 97 23	CONCRETE AND MASONRY COATINGS

DIVISION 10 - SPECIALTIES

10 28 00	TOILET, BATH, AND LAUNDRY ACCESSORIES

END OF TABLE OF CONTENTS

SECTION 000101 - PROJECT TITLE PAGE

PART 1 - GENERAL

1.1 PROJECT MANUAL

A. VOLUME Review Set - Not for Construction.

1. Troup County Fire Station Prototype.
2. Troup County Board of Commissioners.
3. Troup County, Georgia.
4. Architect Project No. 24-01977.
5. 2WR + Partners.
6. 11 Ninth Street, Suite 120.
7. Columbus, GA 31901.
8. Phone: 706-571-6923.
9. Issued: 12-9-2024.
10.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 000101

SECTION 010000 - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 NOT USED

A. Not used.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 010000

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work performed by Owner.
4. Multiple Work Packages.
5. Work under Owner's separate contracts.
6. Owner-furnished/Contractor-installed (OFCI) products.
7. Owner-furnished/Owner-installed (OFOI) products.
8. Contractor's use of site and premises.
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.
2. Section 017300 "Execution" for coordination of Owner-installed products.

1.2 DEFINITIONS

A. Work Package: A group of specifications, drawings, and schedules prepared by the design team to describe a portion of the Project Work for pricing, permitting, and construction.

1.3 PROJECT INFORMATION

A. Project Identification: Troup County Fire Station prototype.

1. Project Location: Troup County, Georgia.

B. Owner: Troup County Board of Commissioners. Lagrange, Georgia.

1. Owner's Representative: James (Jay) Anderson
   Assistant County Manager
   100 Ridley Avenue, Lagrange, GA 30240
   (706)298-3792

C. Architect: 2WR + Partners.

1. Architect's Representative: Alex Griggs
11 Ninth Street, Suite 120, Columbus, GA 31901
(706) 571-6923

D. Architect's Consultants: Architect has retained the following design professionals, who have prepared designated portions of the Contract Documents:

1. Structural Engineering: Wright Engineering, Inc.
7413 Whitesville RD Suite 800, Columbus, GA 31904
(706) 507-0232

a. Structural Engineer Representative: Matt Pearson
b. Scope of Service: Structural Engineering

2. MEP Engineering: Peach Engineering
1214 1st Ave, Columbus, GA, 31901
(706)596-1840

E. Contractor: T.B.D. has been engaged as Contractor for this Project.

1. Contractor Representative: T.B.D.

F. Construction Manager: T.B.D..

1. Construction Manager Representative: T.B.D..
2. Construction Manager 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.

a. Construction Manager also serves as Project coordinator, as defined in Section 011200 "Multiple Contract Summary."

3. Construction Manager for this Project is Project's constructor. The terms "Construction Manager" and "Contractor" are synonymous.

G. Web-Based Project Software: Project software will be used for purposes of managing communication and documents during the construction stage.

1. See Section 013100 "Project Management and Coordination" for requirements for using web-based Project software.

1.4 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and includes, but is not limited to, the following:

1. Construction of a new 7,522 SF Fire Station and associated sleeping quarters. Type VB, unsprinklered / Sprinklered NFPA 13R construction and other Work

indicated in the Contract Documents.

B. Type of Contract:

1. Project will be constructed under a single prime contract with a Guaranteed Maximum Proce.
2. Project will be constructed under coordinated, concurrent multiple contracts. See Section 011200 "Multiple Contract Summary" for a list of multiple contracts, a description of work included under each of the multiple contracts, and the responsibilities of Project coordinator.

1.5 WORK PERFORMED BY OWNER

A. 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.

B. Preceding Work: Owner will perform the following construction operations at Project site. Those operations are scheduled to be substantially complete before Work under this Contract begins.

1. Owner to engage Geotechnical engineer and Civil engineer.

C. Subsequent Work: Owner will perform the following additional work at site after Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.

1. Owner to engage city vendor for installation CCTV security cameras and alarm system.

1.6 WORK UNDER OWNER'S SEPARATE CONTRACTS

A. Work with Separate Contractors: Cooperate fully with Owner's separate contractors, so work on those contracts may be carried out smoothly, without interfering with or delaying Work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under Owner's separate contracts.

B. Subsequent Work: Owner **will award** separate contract(s) for the following additional work to be performed at site following Substantial Completion. Completion of that work will depend on successful completion of preparatory Work under this Contract.

1. Closed Circuit Security Camera and Alarm: To: T.B.D **for Installation of Security Cameras and Security system**.

1.7 OWNER'S PRODUCT PURCHASE CONTRACTS

A. Owner has negotiated Product Purchase contracts with suppliers of material and equipment to be incorporated into the Work. Owner will assign these Product Purchase contracts to Contractor. Include costs for purchasing, receiving, handling, storage if

required, and installation of material and equipment in the Contract Sum unless otherwise indicated.

1. Contractor's responsibilities are same as if Contractor had negotiated Product Purchase contracts, including responsibility to renegotiate purchase and to execute final purchasing agreements.

1.8 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS

A. The Owner will furnish and install products indicated.

B. Owner-Furnished/Owner-Installed (OFOI) Products:

1. Gas fired exterior grill.
2. Security Cameras.
3. Alarm and security system with card readers.

1.9 CONTRACTOR'S USE OF SITE AND PREMISES

A. Unrestricted Use of Site: **Each** Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Restricted Use of Site: **Each** Contractor 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.

C. Limits on Use of Site: Limit use of Project site to **areas within the Contract limits** indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for 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.

D. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

E. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.10 WORK RESTRICTIONS

A. Comply with restrictions on construction operations.

1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.

1.11 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. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. 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. 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 011000

SECTION 012100 - ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:

1. Unit-cost allowances.
2. Contingency allowances.

C. Related Requirements:

1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
2. Section 014000 "Quality Requirements" for procedures governing the use of allowances for field testing by an independent testing agency.

1.2 DEFINITIONS

A. Allowance: A quantity of work or dollar amount included in the Contract, established in lieu of additional requirements, used 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.

1.3 SELECTION AND PURCHASE

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

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

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

1.4 ACTION SUBMITTALS

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

1.5 INFORMATIONAL SUBMITTALS

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

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

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

1.6 UNIT-COST ALLOWANCES

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

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

C. Unused Materials: Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.

1. If requested by Architect, retain and prepare unused material for storage by Owner. Deliver unused material to Owner's storage space as directed.

1.7 CONTINGENCY ALLOWANCES

A. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.

B. Contractor's overhead, profit, and related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.

C. Change Orders authorizing use of funds from the contingency allowance will include Contractor's related costs and reasonable overhead and profit.

D. At Project closeout, credit unused amounts remaining in the contingency allowance to Owner by Change Order.

1.8 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance,

multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, required maintenance materials, and similar margins.

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

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

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

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Unit-Cost Allowance: Include the sum of $3,000.00 per unit for (3) upright reach-in refrigerators with no ice or water as shown on Drawings.

B. Allowance No. 2: Unit-Cost Allowance: Include the sum of $3,000.00 per unit for residential style electric oven with cook top with vent hood including a retrofit Ansul system.

C. Allowance No. 3: Unit-Cost Allowance: Include the sum of $1,000.00 per unit for Residential style Washing Machine

D. Allowance No. 4: Unit-Cost Allowance: Include the sum of $1,000.00 per unit for Residential style Dryer.

E. Allowance No. 5: Unit-Cost Allowance: Include the sum of $5,000.00 per unit for Ice Machine with bin. Model number KMC-H-530-A 30” by Avantco Ice.

F. Allowance No. 6: Unit Cost Allowance: Include the sum of $300.00 per unit for countertop Microwave. Similar to Panasonic Model # NN-SN96JS 2.2 cu ft.

G. Allowance No. 7: Unit Cost Allowance: Include the sum of $900.00 per unit for Plumbed autofill Coffee Maker: Similar to BUNN CWTF-DV-TC

H. Allowance No. 8: Unit-Cost Allowance: Include the sum of $1,500.00 per unit for Emergency Shower Station with Eyewash. Similar to Guardian G1902.

I. Allowance No. 9: Unit-Cost Allowance: Include the sum of $30,000.00 per unit for Stacked Gear Extractor Washer/Dryer. Basis of Design product : UniMac UST50

J. Allowance No. 10: Contingency Allowance: Include a contingency allowance of 5% of total construction cost for use according to Owner's written instructions.

END OF SECTION 012100

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

1.2 MINOR CHANGES IN THE WORK

A. Architect will issue through Construction Manager supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710 form included in Project Manual.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Architect will issue a detailed description of proposed changes in the Work 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. Work Change Proposal Requests issued by Architect are not instructions either to stop work in progress or to execute the proposed change.
2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.

    a. 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.
    b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
    c. Include costs of labor and supervision directly attributable to the change.
    d. Include an updated Contractor's 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 Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Architect.

1. Include a statement outlining reasons for the change and 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 the Contract Time.

2. 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.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's 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.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

1.4 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Work Change Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

1.2 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

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 Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

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.
3. 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.
4. 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.

1.3 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 Architect and paid for by Owner.

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. Application for Payment Forms: Use AIA Document G703 and AIA Document G732 as form for Applications for Payment.

1. Other Application for Payment forms proposed by the Contractor may be acceptable to Architect and Owner. Submit forms for approval with initial submittal of schedule of values.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect 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.

E. 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.

F. Transmittal: Submit **three** signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

G. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

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.

H. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Combined Contractor's construction schedule (preliminary if not final) incorporating Work of multiple contracts, with indication of acceptance of schedule by each Contractor.
5. Products list (preliminary if not final).
6. Sustainable design action plans, including preliminary project materials cost data.
7. Schedule of unit prices.
8. Submittal schedule (preliminary if not final).
9. List of Contractor's staff assignments.
10. List of Contractor's principal consultants.
11. Copies of building permits.
12. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
13. Initial progress report.
14. Report of preconstruction conference.
15. Certificates of insurance and insurance policies.
16. Performance and payment bonds.
17. Data needed to acquire Owner's insurance.

I. 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 017700 "Closeout Procedures."

2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

J. 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 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project, including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. RFIs.
4. Digital project management procedures.
5. Web-based Project management software package.
6. Project meetings.

B. Related Requirements:

1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
2. Section 019113 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results, where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.

5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.3 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely indicated on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
b. Indicate dimensions shown on Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternative sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. 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 Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make suitable modifications and resubmit.

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

1. File Preparation Format:

a. Same digital data software program, version, and operating system as original Drawings.
b. DWG, Version, operating in Microsoft Windows operating system.

2. File Submittal Format: Submit or post coordination drawing files using PDF format.

1.4 REQUEST FOR INFORMATION (RFI)

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

1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
2. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

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

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: AIA Document G716.

1. Attachments shall be electronic files in PDF format.

D. Architect's and Construction Manager's Action: Architect will review each RFI, determine action required, and respond. Allow three days for Architect's response for each RFI. RFIs received by Architect or Construction Manager after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.

e. Requests for adjustments in the Contract Time or the Contract Sum.
f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt by Architect or Construction Manager of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Construction Manager in writing within 5 days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Include the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect and Construction Manager.
4. RFI number, including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's and Construction Manager's response was received.

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

1.5 DIGITAL PROJECT MANAGEMENT PROCEDURES

A. Architect's Data Files Not Available: Architect will not provide Architect's BIM model CAD drawing digital data files for Contractor's use during construction.

B. PDF Document Preparation: Where PDFs are required to be submitted to Architect, prepare as follows:

1. Assemble complete submittal package into a single indexed file, incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
3. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.6 PROJECT MEETINGS

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

B. Preconstruction Conference: Construction Manager will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Attendees: Authorized representatives of Owner, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:

a. Responsibilities and personnel assignments.
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. Use of web-based Project software.
h. Procedures for processing field decisions and Change Orders.
i. Procedures for RFIs.
j. Procedures for testing and inspecting.
k. Procedures for processing Applications for Payment.
l. Distribution of the Contract Documents.
m. Submittal procedures.
n. Preparation of Record Documents.
o. Use of the premises
p. Work restrictions.
q. Working hours.
r. Owner's occupancy requirements.
s. Responsibility for temporary facilities and controls.
t. Procedures for moisture and mold control.
u. Procedures for disruptions and shutdowns.
v. Construction waste management and recycling.
w. Parking availability.
x. Office, work, and storage areas.
y. Equipment deliveries and priorities.
z. First aid.
aa. Security.
bb. Progress cleaning.

3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity when required by other Sections and when required for

coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Construction Manager of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

    a. Contract Documents.
    b. Options.
    c. Related RFIs.
    d. Related Change Orders.
    e. Purchases.
    f. Deliveries.
    g. Submittals.
    h. Sustainable design requirements.
    i. Review of mockups.
    j. Possible conflicts.
    k. Compatibility requirements.
    l. Time schedules.
    m. Weather limitations.
    n. Manufacturer's written instructions.
    o. Warranty requirements.
    p. Compatibility of materials.
    q. Acceptability of substrates.
    r. Temporary facilities and controls.
    s. Space and access limitations.
    t. Regulations of authorities having jurisdiction.
    u. Testing and inspecting requirements.
    v. Installation procedures.
    w. Coordination with other work.
    x. Required performance results.
    y. Protection of adjacent work.
    z. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Project Closeout Conference: Construction Manager will schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.

1. Conduct the conference to review requirements and responsibilities related to Project closeout.
2. Attendees: Authorized representatives of Owner, 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.

3. Agenda: Discuss items of significance that could affect or delay Project 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. Procedures for completing and archiving web-based Project software site data files.
    d. Submittal of written warranties.
    e. Requirements for completing sustainable design documentation.
    f. Requirements for preparing operations and maintenance data.
    g. Requirements for delivery of material samples, attic stock, and spare parts.
    h. Requirements for demonstration and training.
    i. Preparation of Contractor's punch list.
    j. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    k. Submittal procedures.
    l. Coordination of separate contracts.
    m. Owner's partial occupancy requirements.
    n. Installation of Owner's furniture, fixtures, and equipment.
    o. Responsibility for removing temporary facilities and controls.

4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

E. Progress Meetings: Construction Manager will conduct progress meetings at monthly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, Construction Manager, and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
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) Status of sustainable design documentation.
5) Deliveries.
6) Off-site fabrication.
7) Access.
8) Site use.
9) Temporary facilities and controls.
10) Progress cleaning.
11) Quality and work standards.
12) Status of correction of deficient items.
13) Field observations.
14) Status of RFIs.
15) Status of Proposal Requests.
16) Pending changes.
17) Status of Change Orders.
18) Pending claims and disputes.
19) 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.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Construction schedule updating reports.
3. Daily construction reports.

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 Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine the critical path of Project and when activities can be performed.

C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event: The starting or ending point of an activity.

E. Float: The measure of leeway in starting and completing an activity.

1. Float time belongs to Owner.
2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

1.3 INFORMATIONAL SUBMITTALS

A. Format for Submittals: Submit required submittals in the following format:

1. Working electronic copy of schedule file.
2. PDF file.

B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.

1. Submit a working digital copy of schedule, using software indicated, and labeled to comply with requirements for submittals.

1.4 COORDINATION

A. Coordinate Contractor's Construction Schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.

1. Secure time commitments for performing critical elements of the Work from entities involved.
2. Coordinate each construction activity in the network with other activities, and schedule them in proper sequence.

1.5 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion.

1. Contract completion date to not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

B. Activities: Treat each floor or separate area as a separate numbered activity for each main element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead-time 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.
3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with submittal schedule.
4. 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.
5. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and Final Completion.

C. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the

following issues:

1. Unresolved issues.
2. Unanswered Requests for Information.
3. Rejected or unreturned submittals.
4. Notations on returned submittals.
5. Pending modifications affecting the Work and the Contract Time.

D. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
3. As the Work progresses, indicate Final Completion percentage for each activity.

E. Distribution: Distribute copies of approved schedule to Architect, Construction Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

1. Post copies in Project meeting rooms and temporary field offices.
2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.6 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, including presence of rain or snow.
7. Testing and inspection.
8. Accidents.
9. Meetings and significant decisions.
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 Work 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. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List to 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. Indicate the following categories for stored materials:

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.

C. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

D. Unusual Event Reports: 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, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

1. Submit unusual event reports directly to Owner within **one** day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013200

SECTION 013233 - PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Concealed Work photographs.
2. Periodic construction photographs.
3. Final Completion construction photographs.

B. Related Requirements:

1. Section 017700 "Closeout Procedures" for submitting photographic documentation as Project Record Documents at Project closeout.
2. Section 311000 "Site Clearing" for photographic documentation before site clearing operations commence.

1.2 INFORMATIONAL SUBMITTALS

A. Digital Photographs: Submit image files within three days of taking photographs.

1. Submit photos by uploading to web-based Project management software site. Include copy of key plan indicating each photograph's location and direction.
2. Identification: Provide the following information with each image description:

a. Name of Project.
b. Name and contact information for photographer.
c. Name of Contractor.
d. Date photograph was taken.

1.3 FORMATS AND MEDIA

A. Digital Photographs: Provide color images in JPG format, produced by a digital camera with minimum sensor size of 12 megapixels, and at an image resolution of not less than 3200 by 2400 pixels. Use flash in low light levels or backlit conditions.

B. Digital Images: Submit digital media as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

C. Metadata: Record accurate date and time from camera.

D. File Names: Name media files with date Project area and sequential numbering suffix.

1.4 CONSTRUCTION PHOTOGRAPHS

A. General: Take photographs with maximum depth of field and in focus.

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

B. Concealed Work Photographs: Before proceeding with installing work that will conceal other work, take photographs sufficient in number, with annotated descriptions, to record nature and location of concealed Work, including, but not limited to, the following:

1. Underground utilities.
2. Under slab services.
3. Piping.
4. Electrical conduit.
5. Waterproofing and weather-resistant barriers.

C. Periodic Construction Photographs: Take 20 photographs weekly. Select vantage points to show status of construction and progress since last photographs were taken.

D. Final Completion Construction Photographs: Take 20 photographs after date of Substantial Completion for submission as Project Record Documents. Architect will inform photographer of desired vantage points.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013233

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Submittal schedule requirements.
2. Administrative and procedural requirements for submittals.

1.2 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."

1.3 SUBMITTAL SCHEDULE

A. Submittal Schedule: Submit, as an action submittal, a list 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.

1.4 SUBMITTAL FORMATS

A. Submittal Information: Include the following information in each submittal:

1. Project name.
2. Date.
3. Name of Architect.
4. Name of Construction Manager.
5. Name of Contractor.
6. Name of firm or entity that prepared submittal.
7. Names of subcontractor, manufacturer, and supplier.
8. Category and type of submittal.
9. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
10. Remarks.

11. Signature of transmitter.

B. Options: Identify options requiring selection by Architect.

C. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

D. Electronic Submittals: Prepare submittals as PDF package, incorporating complete information into each PDF file. Name PDF file with submittal number.

E. Submittals Utilizing Web-Based Project Software: Prepare submittals as PDF files or other format indicated by Project management software.

1.5 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

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.

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 15 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. Resubmittal Review: Allow 15 days for review of each resubmittal.

D. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

E. 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.

F. 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.

1.6 SUBMITTAL REQUIREMENTS

A. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are unsuitable 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 product specifications.
    b. Standard color charts.

4. Submit Product Data before Shop Drawings, and before or concurrently with Samples.

B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

    a. Identification of products.
    b. Seal and signature of professional engineer if specified.

C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.

1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
2. Identification: Permanently attach label on unexposed side of Samples that includes the following:

    a. Project name and submittal number.
    b. Generic description of Sample.
    c. Product name and name of manufacturer.
    d. Sample source.
    e. Number and title of applicable Specification Section.
    f. Specification paragraph number and generic name of each item.

3. Email Transmittal: Provide PDF transmittal. Include 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.

5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(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.

1.7 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 insufficient 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 digitally signed PDF file 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.

1.8 CONTRACTOR'S REVIEW

A. Action Submittals and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.

1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.9 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate 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. Architect will return without review submittals received from sources other than Contractor.

F. Submittals not required by the Contract Documents will be returned by Architect without action.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Section 012100 "Allowances" for testing and inspection allowances.

1.2 DEFINITIONS

A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, means having successfully completed a minimum of **five** previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).

D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.

1. Mockups are used for one or more of the following:

    a. Verify selections made under Sample submittals.
    b. Demonstrate aesthetic effects.
    c. Demonstrate the qualities of products and workmanship.
    d. Demonstrate successful installation of interfaces between components and systems.
    e. Perform preconstruction testing to determine system performance.

2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

E. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.

F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) in accordance with 29 CFR 1910.7, by a testing agency accredited in accordance with NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).

H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."

I. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work, to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

J. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work, to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Contractor's quality-control services do not include contract administration activities performed by Architect

1.3 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 Statement: Submit a statement 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, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.4 CONFLICTING REQUIREMENTS

A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 ACTION SUBMITTALS

A. Mockup Shop Drawings:

1. Include plans, sections, elevations, and details, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

1.6 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Primary wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.7 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit quality-control plan within **10** days of **Notice to Proceed**, and not less than **five** days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities and to coordinate Owner's quality-assurance and quality-control activities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections, including subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and

inspections from field quality-control tests and inspections.
2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.
3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring the Work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports, including log of approved and rejected results. Include Work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming Work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.8 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

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

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed

performance complies with requirements.
6. Statement of whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement of whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

1.9 QUALITY ASSURANCE

A. Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, applying, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that is similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities be performed by entities who are recognized experts in those operations. Specialists will satisfy qualification requirements indicated and engage in the activities indicated.

1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

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

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor's Responsibilities:

    a. Provide test specimens representative of proposed products and construction.
    b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    d. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
    e. When testing is complete, remove test specimens and test assemblies**,** do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Notify Architect **seven** days in advance of dates and times when mockups will be constructed.
4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at

Project.

5. Demonstrate the proposed range of aesthetic effects and workmanship.
6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.

    a. Allow **seven** days for initial review and each re-review of each mockup.

7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
10. Demolish and remove mockups when directed unless otherwise indicated.

1.10 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspection they are engaged to perform.
2. Payment for these services will be made from testing and inspection allowances specified in Section 012100 "Allowances," as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Engage a qualified testing agency to perform quality-control services.

    a. Contractor will not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspection will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspection requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the locations from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform duties of Contractor.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Section 013300 "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspection. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspection equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-

assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.

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

I. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's Construction Schedule. Update and submit with each Application for Payment.

1. Schedule Contents: Include tests, inspections, and quality-control services, including Contractor- and Owner-retained services, commissioning activities, and other Project-required services paid for by other entities.
2. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.11 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified **special inspector** to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.

4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Protect construction exposed by or for quality-control service activities.

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

END OF SECTION 014000

SECTION 014339 - MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Integrated exterior mockups.

B. Related Requirements:

1. Section 014000 "Quality Requirements" for quality assurance requirements for aesthetic and workmanship mockups specified in other Sections.

1.2 ALLOWANCES

A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 DEFINITIONS

A. Integrated Exterior Mockups: Mockups of the exterior envelope constructed on-site as **freestanding temporary built elements,** consisting of multiple products, assemblies, and subassemblies.

B. Preconstruction Laboratory Mockups: Integrated exterior mockups constructed at testing facility to verify performance characteristics.

C. Room Mockups: Mockups of typical interior spaces complete with wall, floor, and ceiling finishes; doors; windows; millwork; casework; specialties; furnishings and equipment; and lighting as indicated.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review coordination of equipment and furnishings provided by the Owner for room mockups.
2. Review locations and extent of mockups.
3. Review and finalize schedule for mockups, and verify availability of materials, personnel, equipment, and facilities needed to complete mockups and maintain schedule for the Work.

1.5 QUALITY ASSURANCE

A. Build mockups to do the following:

1. Verify selections made under Sample submittals.
2. Demonstrate aesthetic effects.
3. Demonstrate the qualities of products and workmanship.
4. Demonstrate acceptable coordination between components and systems.

B. Fabrication: Before fabricating or installing portions of the Work requiring mockups, build mockups for each form of construction and finish required. Use materials and installation methods as required for the Work.

1. Build mockups of size indicated.
2. Build mockups in location indicated or, if not indicated, as directed by Architect.
3. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed unless otherwise indicated.

C. Notifications:

1. Notify Architect seven days in advance of the dates and times when mockups will be constructed.
2. Allow seven days for initial review and each re-review of each mockup.

D. Approval: Obtain Architect's approval of mockups before starting fabrication or construction of corresponding Work.

1. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
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.

1.6 COORDINATION

A. Coordinate schedule for construction of mockups, so construction, testing, and review of mockups do not impact Project schedule.

PART 2 - PRODUCTS

2.1 INTEGRATED EXTERIOR MOCKUPS

A. Construct integrated exterior mockups according to approved mockup Shop Drawings. Construct mockups to demonstrate constructability, coordination of trades, and sequencing of Work; and to ensure materials, components, subassemblies, assemblies, and interfaces integrate into a system complying with indicated performance and aesthetic requirements.

B. Design and construct foundation and superstructure to support free-standing integrated exterior mockups.

C. Build integrated exterior mockups using installers and construction methods that will be used in completed construction.

D. Use specified products that have been approved by Architect. Coordinate installation of materials and products specified in individual Specification Sections that include Work included in integrated exterior mockups.

E. The Work of integrated exterior mockups includes, but is not limited to, the following:

1. Masonry veneer.
2. Air and weather barriers.
3. Thermal insulation.
4. Through-wall flashing.
5. Flashing and sheet metal trim.
6. Joint sealants.
7. Metal wall panels.
8. Aluminum windows.
9. Glazing.

F. Photographic Documentation: Document construction of integrated exterior mockups with photographs in accordance with Section 013233 "Photographic Documentation." Provide photographs showing details of interface of different materials and assemblies.

1. Document testing procedures, including water leakage and other deficiencies. Photograph modifications to component interfaces intended to correct deficiencies.

G. Provide and document modifications to construction details and interfaces between components and systems required to properly sequence the Work, or to pass performance testing requirements. Obtain Architect's approval for modifications.

H. Retain approved mockups constructed in place. Incorporate fully into the Work.

PART 3 - EXECUTION

Not Used

END OF SECTION 014339

SECTION 014533 – CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements required for compliance with the International Building Code, Chapter 17, Structural Tests and Special Inspections.

B. Structural testing and special inspection services are required to verify compliance with requirements specified or indicated. These services do not relieve contractor of responsibility for compliance with other construction document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the construction document requirements.
3. Requirements for contractor to provide quality-assurance and -control services required by architect, owner, or authorities having jurisdiction are not limited by provisions of this section.

C. The owner will engage one or more qualified special inspectors and / or testing agencies to conduct structural tests and special inspections specified in this section and related sections and as maybe specified in other divisions of these specifications.

1.3 DEFINITIONS

A. Approved Agency: An established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

B. Construction Documents: Written, graphic and pictorial documents prepared or assembled for describing the design, location and physical characteristics of the elements of a project necessary for obtaining a building permit. Construction Documents include all supplemental instructions, sketches, addenda, and revisions to the drawings and specifications issued by the registered design professional beyond those issued for a building permit.

C. Shop Drawings / Submittal Data: Written, graphic and pictorial documents prepared and / or assembled by the contractor based on the Construction Documents.

D. Structural Observation: Visual observation of the structural system by a representative of the registered design professional's office for general conformance to the approved construction documents. Structural observations are not considered part of the structural tests and special inspections and do not replace inspections and testing by the testing agency or special inspector.

E. Special Inspector: A qualified person who demonstrating competence, to the satisfaction of the code enforcement official and registered design professional in responsible charge, for inspection of the particular type of construction or operation requiring special inspection. The special inspector shall be a licensed professional engineer or engineering intern or a qualified representative from the testing agency.

F. Special Inspection, Continuous: The full-time observation of work requiring special inspection by an approved special inspector who is present in the area where the work is being performed.

G. Special Inspection, Periodic: The part-time or intermittent observation of work requiring special inspection by an approved special inspector who is present in the area where the work has been or is being performed and at the completion of the work.

H. Testing Agency: A qualified materials testing laboratory under the responsible charge of a licensed professional engineer, approved by the code enforcement official and the registered design professional in responsible charge, to measure, examine, test, calibrate, or otherwise determine the characteristics or performance of construction materials and verify confirmation with construction documents.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications:
   1. Minimum qualifications of inspection and testing agencies and their personnel shall comply with ASTM E329-03 Standard Specification for Agencies in the Testing and / or Inspection of Materials Used in Construction.
      a. Inspectors and individuals performing tests shall be certified for the work being performed as outlined in the appendix of the ASTM E329. Certification by organizations other than those listed must be submitted to the building official for consideration before proceeding with work.
   2. In addition to these requirements, local jurisdiction may have additional requirements. It is the responsibility of the testing and inspection agencies to meet local requirements and comply with local procedures.

1.5 CONFLICTING REQUIREMENTS, REPORTS, AND TEST RESULTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that

are different, but apparently equal, to the registered design professional in responsible charge for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to the registered design profession in responsible charge for a decision before proceeding.

C. The special inspector's reports and testing agencies' results shall have precedence over reports and test results provided by the contractor.

D. Where a conflict exists between the construction documents and approved shop drawings / submittal data, the construction documents shall govern unless the shop drawings / submittal data are more restrictive. All conflicts shall be brought to the attention of the registered design professional in responsible charge.

1.6 SUBMITTALS BY SPECIAL INSPECTOR AND / OR TESTING AGENCY

A. Special inspectors shall keep and distribute records of inspections. The special inspector shall furnish inspection reports to the building official, and to the registered design professional in responsible charge, contractor, architect, and owner. Reports shall indicate that work inspected was done in conformance to approved construction documents. Discrepancies shall be brought to the immediate attention of the contractor for correction. If the discrepancies are not corrected, the discrepancies shall be brought to the attention of the building official and to the registered design professional in responsible charge prior to the completion of that phase of the work. A final report documenting required special inspections and correction of any discrepancies noted in the inspections shall be submitted at a point in time agreed upon by the permit applicant and the building official prior to the start of work.

1. Special inspection reports and test results shall include, but not be limited to, the following:
    a. Date of inspection.
    b. Description of inspections or tests performed including location (reference grid lines, floors, elevations, etc.).
    c. Statement noting that the work, material, and / or product conforms or does not conform to the construction document requirements.
        1) Name and signature of contractor's representative who was notified of work, material, and / or products that do not meet the construction document requirements.
    d. Name and signature of special inspector and / or testing agency representative performing the work.

B. Schedule of Non-Compliant Work: Each agent shall maintain a log of work that does not meet the requirements of the construction documents. Include reference to original inspection / test report and subsequent dates of re-inspection / retesting.

C. Reports and tests shall be submitted within 1 week of inspection or test. Schedule of Non-Compliant Work shall be updated daily and submitted at monthly intervals.

D. Final Report of Special Inspections. Submitted by each agent listed in the schedule of Structural Testing and Special Inspections.

PART 2 - EXECUTION

2.1 CONTRACTOR'S RESPONSIBILITY

A. The contractor shall coordinate the inspection and testing services with the progress of the work. The contractor shall provide sufficient notice to allow proper scheduling of all personnel. The contractor shall provide safe access for performing inspection and on site testing.

B. The contractor shall submit schedules to the owner, registered design professionals and testing and inspecting agencies. Schedules will note milestones and durations of time for materials requiring structural tests and special inspections.

C. Each contractor responsible for the construction of a seismic-force-resisting system, designated seismic system, or component listed in the quality assurance plan shall submit a written contractor's statement of responsibility to the building official and to the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
   1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
   2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
   3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

D. Each contractor responsible for the construction of a main windforce-resisting system or a wind-resisting component listed in the quality assurance plan shall submit a written statement of responsibility to the building official and the owner prior to the commencement of work on the system or component. The contractor's statement of responsibility shall contain the following:
   1. Acknowledgment of awareness of the special requirements contained in the quality assurance plan.
   2. Acknowledgment that control will be exercised to obtain conformance with the construction documents approved by the building official.
   3. Procedures for exercising control within the contractor's organization, the method and frequency of reporting and the distribution of the reports.
   4. Identification and qualifications of the person(s) exercising such control and their position(s) in the organization.

E. The contractor shall repair and / or replace work that does not meet the requirements of the construction documents.

1. Contractor shall engage an engineer / architect to prepare repair and / or replacement procedures.
2. Engineer / architect shall be registered in the state in which the project is located. Engineer shall be acceptable to the registered design professional in responsible charge, code enforcement official, and owner.
3. Procedures shall be submitted for review and acceptance by the registered design professional in responsible charge, code enforcement official, and owner before proceeding with corrective action.

F. The contractor shall be responsible for costs of:
1. Re-testing and re-inspection of materials, work, and / or products that do not meet the requirements of the construction documents and shop drawings / submittal data.
2. Review of proposed repair and / or replacement procedures by the registered design professional in responsible charge and the inspectors and testing agencies.
3. Repair or replacement of work that does not meet the requirements of the construction documents.

2.2 STRUCTURAL OBSERVATIONS

A. Structural observations may be made periodically as determined by the registered design professional in responsible charge.

2.3 TESTING AND INSPECTION

A. Testing and inspection shall be in accordance with the attached Schedule of Special Inspections.

B. Reference related specifications for the minimum level of inspections and testing. Provide additional inspections and testing as necessary to determine compliance with the construction drawings.

PART 3 - SCHEDULES AND FORMS

Statement of Special Inspections
Requirements for Seismic Resistance

See the Schedule of Special Inspections for inspection and testing requirements.

Seismic Design Category: C

Statement of Special Inspection for Seismic Resistance Required (Yes/No): No
Description of seismic force-resisting system subject to special inspection and testing for seismic resistance:
(Required for Seismic Design Categories C, D, E or F)
Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

Statement of Special Inspections
Requirements for Wind Resistance

See the Schedule of Special Inspections for inspection and testing requirements.

Basic Wind Speed (3 second gust): 120 m.p.h.

Wind Exposure Category: B

Statement of Special Inspection for Wind Resistance Required (Yes/No): Yes
(Required in wind exposure Category B, where the basic wind speed is 120 miles per hour or greater. Required in wind exposure Category C or D, where the basic wind speed is 110 miles per hour or greater)

Description of main wind force-resisting system subject to special inspection for wind resistance:

Description of wind force-resisting components subject to special inspection for wind resistance:

Statement of Responsibility:
Each contractor responsible for the construction or fabrication of a system or component described above must submit a Statement of Responsibility.

SCHEDULE OF SPECIAL INSPECTIONS (See plans)

3.1 FINAL REPORT OF SPECIAL INSPECTIONS.

END OF SECTION 014533

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

A. Installation, removal, and use charges for temporary facilities to be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer-service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water-service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric-power-service use charges for electricity used by all entities for construction operations.

1.3 INFORMATIONAL SUBMITTALS

A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.

B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

1.4 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless

of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices:

1. Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.2 EQUIPMENT

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

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 INSTALLATION, GENERAL

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

1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

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

3.3 TEMPORARY UTILITY INSTALLATION

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

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

B. Water Service:

1. Install water service and distribution piping in sizes and pressures adequate for construction.

C. Sanitary Facilities: Provide temporary toilets, wash facilities, safety shower and eyewash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

D. Electric Power Service:

1. Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

a. Install electric power service underground unless otherwise indicated.

E. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install WiFi cell phone access equipment and one land-based telephone line(s) for each field office.

F. Electronic Communication Service: Provide secure WiFi wireless connection to internet with provisions for access by Architect and Owner.

3.4 SUPPORT FACILITIES INSTALLATION

A. Comply with the following:

1. Provide construction for temporary field offices, shops, and sheds located within construction area or within **30 feet** of building lines that is noncombustible in accordance with ASTM E136. Comply with NFPA 241.
2. Utilize designated area within existing building for temporary field offices.
3. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

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

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

C. Traffic Controls: Comply with requirements of authorities having jurisdiction.

1. Protect existing site improvements to remain, including curbs, pavement, and utilities.

2. Maintain access for fire-fighting equipment and access to fire hydrants.

D. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

E. Storage and Staging: Use designated areas of Project site for storage and staging needs.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touch up signs, so they are legible at all times.

G. Waste Disposal Facilities:

1. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

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

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

3.5 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

C. Temporary Erosion and Sedimentation Control:

D. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Site Enclosure Fence: Before construction operations begin, furnish and install site

enclosure fence in a manner that will prevent people from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

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

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

3.6 MOISTURE AND MOLD CONTROL

A. Moisture and Mold Protection: Protect stored materials and installed Work in accordance with Moisture and Mold Protection Plan.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

3.7 OPERATION, TERMINATION, AND REMOVAL

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

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

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

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

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no

later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 015723 - TEMPORARY STORM WATER POLLUTION CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Temporary stormwater pollution controls.

1.2 STORMWATER POLLUTION PREVENTION PLAN

A. The Stormwater Pollution Prevention Plan (SWPPP) is part of the Contract Documents and is bound into this Project Manual.

1.3 INFORMATIONAL SUBMITTALS

A. Stormwater Pollution Prevention Plan (SWPP): Within 15 days of date established for commencement of the Work, submit completed SWPPP.

1.4 QUALITY ASSURANCE

A. Stormwater Pollution Prevention Plan (SWPPP) Coordinator: Experienced individual or firm with a record of successful water pollution control management coordination of projects with similar requirements.

1. SWPPP Coordinator shall complete and finalize the SWPPP form.
2. SWPPP Coordinator shall be responsible for inspections and maintaining of all requirements of the SWPPP.

PART 2 - PRODUCTS

2.1 TEMPORARY STORMWATER POLLUTION CONTROLS

A. Provide temporary stormwater pollution controls as required by the SWPPP.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with all best management practices, general requirements, performance requirements, reporting requirements, and all other requirements included in the

SWPPP.

B. Locate stormwater pollution controls in accordance with the SWPPP.

C. Conduct construction as required to comply with the SWPPP and that minimize possible contamination or pollution or other undesirable effects.

1. Inspect, repair, and maintain SWPPP controls during construction.

a. Inspect all SWPPP controls not less than every seven days, and after each occurrence of a storm event, as outlined in the SWPPP.

D. Remove SWPPP controls at completion of construction and restore and stabilize areas disturbed during construction.

END OF SECTION 015723

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes: Administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

B. Related Requirements:

1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products unless otherwise indicated.
3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.

1. Evaluating Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification. Manufacturer's published attributes and characteristics of basis-of-design product also establish salient

characteristics of products for purposes of evaluating comparable products.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.

D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:

1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.
2. Data indicating compliance with the requirements specified in "Comparable Products" Article.

E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."

F. Substitution: Refer to Section 012500 "Substitution Procedures" for definition and limitations on substitutions.

1.3 QUALITY ASSURANCE

A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

1.5 PRODUCT WARRANTIES

A. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements

for submitting special warranties.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

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

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in Specifications establish salient characteristics of products.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."

2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

    a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."

3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

    a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."

4. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that

complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.

a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."

5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

a. For approval of products by unnamed manufacturers, comply with requirements in Section 012500 "Substitution Procedures" for substitutions for convenience.

2.2 COMPARABLE PRODUCTS

A. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for a comparable product. Architect will notify Contractor through Construction Manager of approval or rejection of proposed comparable product within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

1. Architect's Approval of Submittal: Marked with approval notation from Architect's action stamp. See Section 013300 "Submittal Procedures."
2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 SUMMARY

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

1. Construction layout.
2. Cutting and patching.
3. Coordination of Owner's portion of the Work.
4. Progress cleaning.
5. Protection of installed construction.
6. Correction of the Work.

B. Related Requirements:

1. Section 011000 "Summary" for coordination of Owner-furnished products, and limits on use of Project site.
2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, replacing defective work, and final cleaning.

1.2 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.3 CLOSEOUT SUBMITTALS

A. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

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

B. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, and water-service piping; underground electrical services; and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

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

3.2 PREPARATION

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

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

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Construction Manager in accordance with requirements in Section 013100 "Project Management and Coordination."

3.3 INSTALLATION

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

1. Make vertical work plumb, and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
4. Maintain minimum headroom clearance of 96 inches in occupied spaces and 90 inches in unoccupied spaces, unless otherwise indicated on Drawings.

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

C. Install products at the time and under conditions that will ensure satisfactory results as judged by Architect. Maintain conditions required for product performance until Substantial Completion.

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

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on-site and placement in permanent locations.

F. Tools and Equipment: Select tools or equipment that minimize production of excessive noise levels.

G. Templates: Obtain and distribute to the parties involved templates for Work specified to be factory prepared and field installed. Check Shop Drawings of other portions of the Work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions with manufacturer.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed Work are not indicated, arrange joints for the best visual effect, as judged by Architect. Fit exposed connections together to form hairline joints.

3.4 CUTTING AND PATCHING

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

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

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

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

D. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

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

diamond-core drill.

4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

E. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as practicable, as judged by Architect. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch, corner to corner of wall and edge to edge of ceiling. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

F. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.5 PROGRESS CLEANING

A. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above **80 deg F**.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, in accordance with regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

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

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

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

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

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

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

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 017419 "Construction Waste Management and Disposal."

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

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

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

3.6 PROTECTION OF INSTALLED CONSTRUCTION

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

B. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.

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

3.7 CORRECTION OF THE WORK

A. Repair or remove and replace damaged, defective, or nonconforming Work. Restore damaged substrates and finishes.

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

B. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.

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

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

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

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

END OF SECTION 017300

SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section includes administrative and procedural requirements for the following:

1. Disposing of nonhazardous construction waste.

1.2 DEFINITIONS

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

B. Demolition Waste: Building, structure, and site improvement materials resulting from demolition operations.

C. Disposal: Removal of demolition or construction waste and subsequent salvage, sale, recycling, or deposit in landfill, incinerator acceptable to authorities having jurisdiction, or designated spoil areas on Owner's property.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan within 7 days of date established for the Notice to Proceed. Plan must include the following:

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with transportation and disposal regulations of authorities having jurisdiction.

B. Waste Management Conference(s): Conduct conference(s) at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.5 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan in accordance with requirements in this Section. Plan must include provisions for waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

PART 2 - PRODUCTS
PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

1. Comply with operation, termination, and removal requirements in Section 015000 "Temporary Facilities and Controls."

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

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged and recycled.
2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 DISPOSAL OF WASTE

A. Except for items or materials to be salvaged or recycled, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

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

B. Burning:

1. Do not burn waste materials.

END OF SECTION 017419

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. List of incomplete items.
4. Submittal of Project warranties.
5. Final cleaning.

B. Related Requirements:

1. Section 017823 "Operation and Maintenance Data" for additional operation and maintenance manual requirements.
2. Section 017839 "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
3. Section 017900 "Demonstration and Training" for requirements to train Owner's maintenance personnel to adjust, operate, and maintain products, equipment, and systems.

1.2 ACTION SUBMITTALS

A. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

1.3 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

1.4 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's "punch list"), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify

Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1.5 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining Final Completion, complete the following:

1. Submit a final Application for Payment in accordance with Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list will state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the Work will be completed and ready for final inspection and tests. On receipt of request, Architect and Construction Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1.6 LIST OF INCOMPLETE ITEMS

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor, listed by room or space number.
2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect and Construction Manager.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel Electronic File: Architect, through Construction Manager, will return annotated file.
    b. PDF Electronic File: Architect, through Construction Manager, will return annotated file.

1.7 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

C. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

1. Submit by email to Architect.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

a. Clean Project site of rubbish, waste material, litter, and other foreign substances.
b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.

c. Rake grounds that are not planted, mulched, or paved to a smooth, even-textured surface.
d. Remove tools, construction equipment, machinery, and surplus material from Project site.
e. Remove snow and ice to provide safe access to building.
f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
g. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
h. Clean flooring, removing debris, dirt, and staining; clean in accordance with manufacturer's instructions.
i. Vacuum and mop concrete.
j. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean in accordance with manufacturer's instructions if visible soil or stains remain.
k. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
l. Remove labels that are not permanent.
m. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
q. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
r. Clean strainers.
s. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Comply with waste-disposal requirements in Section 017419 "Construction Waste Management and Disposal."

3.2 CORRECTION OF THE WORK

A. Complete repair and restoration operations required by "Correction of the Work" Article in Section 017300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory manuals.
2. Emergency manuals.
3. Systems and equipment operation manuals.
4. Systems and equipment maintenance manuals.
5. Product maintenance manuals.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating operation and maintenance manuals covering the Work of multiple contracts.
2. Section 013300 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
3. Section 018626 "Electrical Performance Requirements" for requirements for Electrical Preventative Maintenance (EPM) Program binders that form part of the operation and maintenance data of this Section and include additional requirements for operation, maintenance, and emergency procedures, for electrical systems and equipment.
4. Section 019113 "General Commissioning Requirements" for verification and compilation of data into operation and maintenance manuals.

1.2 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.3 CLOSEOUT SUBMITTALS

A. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operation and maintenance submittals is acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit **on digital media acceptable to Architect.** Enable reviewer comments on draft submittals.
2. Submit **three** paper copies. Architect will return **two** copies.

C. Initial Manual Submittal: Submit draft copy of each manual at least **30** days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least **15** days before commencing demonstration and training. Architect will return copy with comments.

1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within **15** days of receipt of Architect's and prior to commencing demonstration and training.

E. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.4 FORMAT OF OPERATION AND MAINTENANCE MANUALS

A. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

B. Manuals, Paper Copy: Submit manuals in the form of hard-copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, **post-type** binders, in thickness necessary to accommodate contents, sized to hold **8-1/2-by-11-inch** paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.

b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, **and** subject matter of contents**, and indicate Specification Section number on bottom of spine**. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment. Enclose title pages and directories in clear plastic sleeves.
4. Supplementary Text: Prepared on **8-1/2-by-11-inch** white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

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

1.5 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization of Manuals: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual to contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.
7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section

number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation in accordance with ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

1.6 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:

1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
2. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.7 EMERGENCY MANUALS

A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

B. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

C. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.

2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

D. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

E. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

1.8 SYSTEMS AND EQUIPMENT OPERATION MANUALS

A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

C. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

D. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

F. Piped Systems: Diagram piping as installed, and identify color coding where required for identification.

1.9 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

B. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranties and bonds as described below.

C. Source Information: List each system, subsystem, and piece of equipment included in

manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins; include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

    a. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

E. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

F. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

G. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

I. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

J. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of maintenance manuals.

1.10 PRODUCT MAINTENANCE MANUALS

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

B. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

C. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

D. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

E. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Section 011200 "Multiple Contract Summary" for coordinating Project Record Documents covering the Work of multiple contracts.
2. Section 017300 "Execution" for final property survey.
3. Section 017700 "Closeout Procedures" for general closeout procedures.
4. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit **one** set(s) of marked-up record prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

a. Initial Submittal:

1) Submit **one** paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and **one** set(s) of file prints.
3) Submit Record Digital Data Files and **one** set(s) of plots.
4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit **three** paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned Record Prints and **three** set(s) of file prints.
3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit **one** paper-copy set(s) of marked-up record prints.
2) Submit Record Digital Data Files and **three** set(s) of Record Digital Data File plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit **annotated PDF electronic files** of Project's Specifications, including addenda and Contract modifications.

C. Record Product Data: Submit **annotated PDF electronic files and directories** of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit **annotated PDF electronic files and directories** of each submittal.

E. Reports: Submit written report **weekly** indicating items incorporated into Project Record Documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

1.3 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation, where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations.
d. Locations and depths of underground utilities.

e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or **Work** Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record prints with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as for the original Contract Drawings.
2. Format: **DWG**, Version 2010, **Microsoft Windows** operating system.
3. Format: Annotated PDF electronic file **with comment function enabled**.
4. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
5. Refer instances of uncertainty to Architect for resolution.
6. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.

    a. See Section 013100 "Project Management and Coordination" for requirements related to use of Architect's digital data files.
    b. Architect will provide data file layer information. Record markups in separate layers.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file **with comment function enabled**.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.

4. Identification: As follows:

    a. Project name.
    b. Date.
    c. Designation "PROJECT RECORD DRAWINGS."
    d. Name of Architect.
    e. Name of Contractor.

1.4 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders**, Record Product Data,** and Record Drawings where applicable.

B. Format: Submit record specifications as **annotated PDF electronic file and scanned PDF electronic file(s) of marked-up paper copy of Specifications**.

1.5 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and revisions to Project Record Documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders**, Record Specifications,** and Record Drawings where applicable.

C. Format: Submit Record Product Data as **annotated PDF electronic files.**

1. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.6 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as **PDF electronic file**.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.7 MAINTENANCE OF RECORD DOCUMENTS

A. Maintenance of Record Documents: Store Record Documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Qualification Data: For **instructor**

C. Attendance Record: For each training module, submit list of participants and length of instruction time.

D. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit **two** copies within **seven** days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

a. Name of Project.
b. Name and address of videographer.
c. Name of Architect.
d. Name of Construction Manager.
e. Name of Contractor.
f. Date of video recording.

2. Transcript:

    a. Prepared and bound in format matching operation and maintenance manuals. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.
    b. Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.

3. At completion of training, submit complete training manual(s) for Owner's use prepared in same **paper and PDF file** format required for operation and maintenance manuals specified in Section 017823 "Operation and Maintenance Data."

1.4 QUALITY ASSURANCE

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

B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Pre-instruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.

f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
   g. Instructions on stopping.
   h. Normal shutdown instructions.
   i. Operating procedures for emergencies.
   j. Operating procedures for system, subsystem, or equipment failure.
   k. Seasonal and weekend operating instructions.
   l. Required sequences for electric or electronic systems.
   m. Special operating instructions and procedures.

5. Adjustments: Include the following:

   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:

   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning.
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:

   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner **through Architect** with at least **seven** days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of **a written** performance-based test.

F. Cleanup: Collect used and leftover educational materials and **give to Owner**. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.9 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: 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.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Digital Video Recordings: Provide high-resolution, digital video in MPEG format,

produced by a digital camera with minimum sensor resolution of **12** megapixels and capable of recording in full HD mode.

1. Submit video recordings **on CD-ROM or thumb drive**.
2. File Hierarchy: Organize folder structure and file locations in accordance with Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged in accordance with Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by **audio narration by microphone while** video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

PART 2 - PRODUCTS (Not Used)
PART 3 - EXECUTION (Not Used)

END OF SECTION 017900

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

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

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.

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.

1.3 INFORMATIONAL SUBMITTALS

1.4 QUALITY ASSURANCE

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 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.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."
2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

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.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.
2. Section 035300 "Concrete Topping" for emery- and iron-aggregate concrete floor toppings.

1.2 DEFINITIONS

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

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

1.3 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:
    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
5. Vapor retarders.
6. Joint fillers.

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

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.

5. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Steel-fiber reinforcement content.
10. Synthetic micro-fiber content.
11. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
12. Include manufacturer's certification that permeability-reducing admixture is compatible with mix design.
13. Include certification that dosage rate for permeability-reducing admixture matches dosage rate used in performance compliance test.
14. Intended placement method.
15. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician with experience installing and finishing concrete, incorporating permeability-reducing admixtures.

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 that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and 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 average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
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.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

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.

1.7 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, GENERAL

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

2.2 CONCRETE MATERIALS

A. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, white.

2. Fly Ash: ASTM C618, Class C or F.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:
   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.
2. Maximum Coarse-Aggregate Size: 1-1/2 inches nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

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

D. Water and Water Used to Make Ice: ASTM C94/C94M, potable or complying with ASTM C1602/C1602M, including all limits listed in Table 2 and the requirements of paragraph 5.4.

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A; not less than 10 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber.

2.05 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, 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 cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 15 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use admixture in concrete, as required, for placement and workability.

2.06 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 F1 S1 W1 C1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content:
   a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size.
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Class B: Normal-weight concrete used for foundation walls.

1. Exposure Class: ACI 318 F1 S1 W1 C1.
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum w/cm: 0.45.
4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content:
   a. Exposure Class F1: 5.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
7. Add Xypex Waterproofing Admixture C500, or equivalent, at a rate of 2.5% by weight of cementitious material to all foundation retaining walls. Xypex representative to review and confirm appropriate dosage in mix design submittal.
8.

C. Class C: Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 F0 S0 W0 C0.
2. Minimum Compressive Strength: 3500 psi at 28 days.
3. Maximum w/cm: 0.50.
4. Minimum Cementitious Materials Content: 520 lb/cu. yd.
5. Slump Limit: 5 inches, plus or minus 1 inch.
6. 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.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
8. Add Vapor Lock 20/21 (ASTM C494 Type S), or equivalent, to all interior slabs on grade. Dosage to be manufacturers standard dosage and should be added to concrete mix in accordance with manufacturer's instructions. Dosage must be included in mix design submittal and must be reviewed and confirmed by a Vapor Lock representative.
9. Reinforce all slabs on grade with 6x6-W2.1xW2.1 unless noted otherwise.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and 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 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 ANSI/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.

3.4 INSTALLATION OF VAPOR RETARDER

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.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 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.
    b. Do not continue reinforcement through sides of strip placements of floors and slabs.
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.

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-third of concrete thickness as follows:

1. 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.

3.6 CONCRETE PLACEMENT

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. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

E. 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.

F. 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 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.
   a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
   b. Remove projections larger than 1 inch.
   c. Tie holes do not require patching.
   d. Surface Tolerance: ACI 117 Class D.
   e. Apply to concrete surfaces not exposed to public view.
2. ACI 301 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, or to be covered with a coating or covering material applied directly to concrete.
3. ACI 301 Surface Finish SF-3.0:
   a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
   b. Remove projections larger than 1/8 inch.
   c. Patch tie holes.
   d. Surface Tolerance: ACI 117 Class A.
   e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.8 FINISHING FLOORS AND SLABS

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

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.

3.9 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 blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 TOLERANCES

A. Conform to ACI 117.

3.11 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).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of 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.

3.12 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: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with 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 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.
        13) Information on storage and curing of samples before testing, 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.

C. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

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 50 cu. yd. or fraction thereof.
   a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing 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 placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
3. Slump Flow: ASTM C1611/C1611M:
   a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
   b. Perform additional tests when concrete consistency appears to change.
4. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;
   a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
5. Concrete Temperature: ASTM 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.
6. Unit Weight: ASTM C567/C567M fresh unit weight of 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.
7. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.
   b. Cast, initial cure, and field cure two sets of two standard cylinder specimens for each composite sample.
8. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
   b. Test one set of two field-cured specimens at seven days and one set of two specimens at 28 days.
   c. 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.
9. 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.
10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi 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.

11. 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.
12. 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 1.6.6.3.
13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
14. 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 48 hours of completion of floor finishing and promptly report test results to Architect.

3.13 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 on concrete surfaces.
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 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Lintels.
3. Brick.
4. Mortar and grout materials.
5. Reinforcement.
6. Ties and anchors.
7. Embedded flashing.
8. Accessories.
9. Mortar and grout mixes.

B. Products Installed but not Furnished under This Section:

1. Cast-stone trim in unit masonry.
2. Steel lintels in unit masonry.
3. Steel shelf angles for supporting unit masonry.
4. Cavity wall insulation adhered to masonry backup.

C. Related Requirements:

1. Section 072100 "Thermal Insulation" for cavity wall insulation.
2. Section 076200 "Sheet Metal Flashing and Trim" for **exposed** sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 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 Initial Selection:

1. Concrete face brick, in the form of small-scale units.
2. Clay face, Hollow brick, in the form of straps of five or more bricks.
3. Colored mortar.
4. Weep/cavity vents.

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

1. Exposed, Decorative CMUs.
2. Clay face, Hollow brick, in the form of straps of five or more bricks.
3. Special brick shapes.
4. Pigmented, colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
5. Weep/cavity vents.
6. Cavity drainage material.
7. Accessories embedded in masonry.

1.5 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.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Material Certificates: For each type of the following:

1. Masonry units.

a. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
b. For exposed brick, include test report for efflorescence in accordance with ASTM C67/C67M.
c. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include name of manufacturer, brand name, and type.

3. Mortar admixtures.
4. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
5. Grout mixes. Include description of type and proportions of ingredients.
6. Reinforcing bars.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

C. Delegated design engineer qualifications.

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.

1.6 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.

1.7 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 multi wythe 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. Obtain exposed masonry units from a single source, manufacturer.

B. For 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, units are listed by UL or a qualified testing agency acceptable to authorities having jurisdiction.

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, lightweight.

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.
3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

C. Concrete Building Brick: ASTM C55, normal weight.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2500 psi.
2. Size (Actual Dimensions): **3-5/8 inches** wide by 2-1/4 inches high by **7-5/8 inches** long.

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 BRICK

A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:

1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.

B. Building (Common) Brick: ASTM C62, **Grade MW or Grade SW.**

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 4950 psi.
2. Size (Actual Dimensions): 3-5/8 inches wide by 2-1/4 inches high by 7-5/8 inches long.

2.7 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 WILL NOT BE ALLOWED TO BE USED ON THIS PROJECT.**

E. Mortar Cement: ASTM C1329/C1329M**.**

F. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C979/C979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Manufacturers: Subject to compliance with requirements, provide one of the following:

a. Davis Colors.

b. Euclid Chemical Company.
c. Lanxess Corporation.

G. Colored Cement Products: Packaged blend made from Portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.

1. Colored Portland Cement -Lime Mix:

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

1) **Argos USA LLC**
2) **Essroc.**
3) **Holcim (US) Inc**

2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
3. Pigments do not exceed 10 percent of Portland cement by weight.
4. Pigments do not exceed 5 percent of mortar cement by weight.

H. 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 ¼ inch (6.4 mm) thick, use aggregate graded with 100 percent passing the No 16. (1.18 mm) sieve.
3. White-Mortar Aggregates: natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

I. Aggregate for Grout: ASTM C404.

J. Cold-Weather Admixture: Non-Chloride, noncorrosive, accelerating admixture complying with ASTM C494/C494M, Type C or ASTM C1384, and recommended by manufacturer for use in masonry mortar of composition indicated.

K. Water: Potable.

2.8 REINFORCEMENT

A. Uncoated-Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, **Grade 60**.

B. 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. Wire Size for Veneer Ties: 0.148-inch diameter.
6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than **16 inches** o.c.
7. Provide in lengths of not less than **10 ft.**, with prefabricated corner and tee units.

C. Masonry-Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

D. Masonry-Joint Reinforcement for Multiwythe Masonry:

1. Adjustable (two-piece) type, ladder truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum horizontal play of 1/16 inch (1.6 mm) and maximum vertical adjustment of 1-1/4 inches (32mm). Size ties to extend at least halfway through facing wythe but with at least 5/8 inch (16mm) cover on outside face.

2.9 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.

C. Individual Wire Ties: Basis of Desing: Tapcon Sure Tie #4530

1. Provide adjustable #4510 Sure Tie triangle wire ties.
2. Provide #4530 Tapcon Sure Tie Anchors with Blue Climaseal finish per ASTM-B-117.
3. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of **1-1/4 inches**.
4. Wire: Fabricate from 3/16-inch - diameter, hot-dip galvanized steel wire.

D. 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.
2. Tie Section: Triangular-shaped wire tie made from **0.187-inch-**diameter, **hot-dip galvanized steel** wire.

2.10 EMBEDDED FLASHING

1. General: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" and as follows:

a. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.016 inch** thick.
b. Fabricate continuous flashings in sections **96 inches** long minimum, but not exceeding **12 ft.**. Provide splice plates at joints of formed, smooth metal flashing.
c. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing **1/2 inch** out from wall, with outer edge bent down 30 degrees and hemmed.
d. Fabricate metal drip edges from stainless steel. Extend at least **3 inches** into wall and **1/2 inch** out from wall, with outer edge bent down 30 degrees and hemmed.
e. Fabricate metal expansion-joint strips from stainless steel to shapes indicated.
f. Solder metal items at corners.

B. Flexible Flashing: Use the following unless otherwise indicated:

1. Self-adhering, Stainless Steel Fabric Flashing: Composite, flashing product consisting of 2 mil (0.05 mm) of Type 304 stainless steel sheet, bonded to a layer of polymeric fabric with a butyl adhesive, to produce an overall thickness of 10mil (0.25mm).

a. Applications: Use 10-mil-(0.25mm) thick flashing at windows, doors, and small wall penetrations; not at base of walls. Use 40 mil (1.0mm) thick flashing at base of walls.

C. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."

1. Solder for Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.
2. Elastomeric Sealant: ASTM C920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and remain watertight.

D. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

E. Termination Bars for Flexible Flashing: Stainless steel bars 1/8 inch by 1-1/8 inch.

2.11 ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or, PVC.

B. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

C. Weep/Cavity Vents: Use the following unless otherwise indicated:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth **1/8 inch** less than depth of outer wythe, in color selected from manufacturer's standard.

D. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Mortar Deflector: Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches that prevent clogging with mortar droppings.

2.12 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, or, mortar cement 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.
4. **DO NOT USE MASONRY CEMENT FOR ANY MASONRY INSTALLATION ON THIS PROJECT. IF MASONRY CEMENT IS FOUND ON THE PROJECT, ALL MASONRY INSTALLED WILL BE REJECTED, DECLARED DEFECTIVE WORK AND WILL BE IMMEDIATELY REMOVED.**

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.

1. For masonry below grade or in contact with earth, use Type M.
2. For reinforced masonry, use Type S.
3. For exterior, above-grade, load-bearing, non-load-bearing walls, and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
4. For interior non-load-bearing partitions, Type O may be used instead of Type N.

D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments do not exceed 10 percent of Portland cement by weight.
2. Pigments do not exceed 5 percent of mortar cement by weight.
3. Mix to match Architect's sample.

E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.

1. Mix to match Architect's sample.

F. 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,or,paragraph 4.2.1.2 for specified 28-day compressive strength indicated, but not less than 2000 psi.
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.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch** except due to warpage of masonry units within tolerances specified for warpage of units.

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**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch**. Do not vary from adjacent bed-joint and head-joint

thicknesses by more than 1/8 inch.

5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch** from one masonry unit to the next.

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 non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
3. 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, and, hollow brick 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 and hollow brick 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. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.

1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
2. Allow cleaned surfaces to dry before setting.
3. Wet joint surfaces thoroughly before applying mortar.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

E. Cut joints flush where indicated to receive bituminous and ,cavity wall insulation, unless otherwise indicated.

3.6 CAVITY WALLS

A. Bond wythes of cavity walls together as follows:

1. Masonry-Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use type reinforcement.
b. Where bed joints of wythes do not align, use adjustable-type (two-piece-type) reinforcement
c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable-type (two-piece-type) reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.

2. Masonry-Veneer Anchors: Comply with requirements for anchoring masonry veneers.

B. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

C. Installing Cavity Wall Insulation: Place small dabs of adhesive, spaced approximately **12 inches** o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as indicated.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 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.

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 as follows:

1. Install preformed control-joint gaskets designed to fit standard sash block.

C. Form expansion joints in brick as follows:

1. Form open joint full depth of brick wythe and of width indicated, but not less than 3/8 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an airspace or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting

masonry.

3.9 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete~~masonryoroffset angle support~~ lintels where indicated and where openings of more than **12 inches** for brick-size units and **24 inches** for block-size units are indicated without structural steel or other supporting lintels.

C. Provide minimum bearing of **8 inches** at each jamb unless otherwise indicated.

3.10 FLASHING, WEEP HOLES, AND CAVITY VENTS

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install cavity vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.

B. Install flashing as follows unless otherwise indicated:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multi wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and through inner wythe to within **1/2 inch** of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately **2 inches** on interior face.
3. At multi wythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and **1-1/2 inches** into the inner wythe.
4. At lintels and shelf angles, extend flashing **6 inches** minimum, to edge of next full unit at each end. At heads and sills, extend flashing **6 inches** minimum, to edge of next full unit and turn ends up not less than **2 inches** to form end dams.
5. Install metal drip edges with sawtooth sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing **1/2 inch** back from outside face of wall, and adhere flexible flashing to top of metal drip edge.

C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of

CMU cell pans at CMU webs and extend from face shell to face shell.

D. Install reglets and nailers for flashing and other related construction where they are indicated to be built into masonry.

E. Install weep holes in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use open-head joints to form weep holes.
2. Space weep holes **24 inches** o.c. unless otherwise indicated.

F. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than **2 inches**, to maintain drainage.

1. Fill cavities full height by placing pea gravel in cavities as masonry is laid, so that at any point, masonry does not extend more than **24 inches** above top of pea gravel.

G. Place cavity drainage material in **cavities airspace behind veneers** to comply with configuration requirements for cavity drainage material in "Accessories" Article.

H. Install cavity vents in head joints in exterior wythes at spacing indicated. Use open-head joints to form cavity vents.

1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.11 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.

3.12 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 non masonry 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.

3.13 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. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

C. 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 Owner's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural steel.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. Shop primer.

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

1.4 QUALITY ASSURANCE

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

B. Installer Qualifications: A qualified Installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.

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 360.

2.2 STRUCTURAL-STEEL MATERIALS

A. Channels, Angles: ASTM A36/A36M.

B. Plate and Bar: ASTM A36/A36M.

C. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

D. Welding Electrodes: Comply with AWS requirements.

2.3 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.

2.4 SHOP CONNECTIONS

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

2.5 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces to be field welded.
2. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
3. 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. 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.

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.

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

3.2 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Maintain erection tolerances of structural steel within ANSI/AISC 303.

3.3 FIELD CONNECTIONS

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

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

3.4 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.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

1. 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.

END OF SECTION 051200

SECTION 060000 – WOODS & PLASTICS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Simulated Wood Trim Architectural Components:

1. Porch Brackets.

1.2 REFERENCES

A. ASTM D 792 – Density and Specific Gravity of Plastics by Displacement.

B. ASTM D 570 – Water Absorption of Plastics.

C. ASTM D 638 – Tensile properties of Plastics.

D. ASTM D 790 – Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

E. ASTM D 1762 – Mechanical Fasteners in Wood.

F. ASTM D 5420 – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by means of a Striker Impacted by a Falling Weight..

G. ASTM D 256 – Determining the Pendulum Impact Resistance of Plastics.

H. ASTM D 696 – Coefficient of Linear Thermal Expansion of Plastics Between minus 30 degrees C and 30 degrees C with a Vitreous Silica Dilatometer.

I. ASTM D 635 – Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

J. ASTM E 84 – Surface Burning and/or Characteristics of Building Materials.

K. ASTM D 648 – Deflection Temperature of Plastics Under Flexural Load in the Edgewise Position.

L. ASTM d 3679 – Standard Specification for Rigid Poly Vinyl Chloride (PVC) Siding.

1.3 SUBMITTALS

A. Product Data: Manufacturer’s data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.

3. Installation instructions.

B. Verification Samples: For each product specified, two samples, minimum size 6 inches (150mm) long, representing actual product, color, and finish.

C. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer with a minimum of 5 years producing PVC trim products.

B. Installer Qualifications: Installer with a minimum of 3 years experience with the installation of PVC trim products.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.

1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.
4. Accepted mock-ups shall be comparison for remaining work.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Trim materials should be stored on a flat and level surface on a full shipping pallet. Handle materials to prevent damage to product edges and corners.

C. Store materials under a protective covering to prevent jobsite dirt and residue from collecting on the boards.

1.6 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

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 absolute limits.

1.8 WARRANTY

A. Provide manufacturer's 30 year transferable warranty against defects in manufacturing that causes the products to rot, corrode, delaminate, or excessively swell from moisture.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Acceptable Manufacturer: Durabrac Architectural Components, which is located at: 909 North Tarragona ST.; Pensacola, FL 32501; Tel: 850-433-4981; Fax: 850-433-7506; Email: mike@durabrac.com; Web: www.durabrac.com
2. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 MATERIALS

A. PVC: Free Foam Cellular PVC material with a small-cell microstructure and density of .55 grams/cm.

1. Performance and physical characteristic requirements:

a. Physical:

1) Density: 0.55 g/CM when tested in accordance with ASTM D 792.
2) Water Absorption: Less than .050 percent when tested in accordance with ASTM D570.

b. Mechanical:

1) Tensile Strength: 3582 psi when tested in accordance with ASTM D 638.
2) Tensile Modulus: 107,000 psi when tested in accordance with ASTM D 638.
3) Flexural Strength: 5179 psi when tested in accordance with ASTM D 790.
4) Modulus of Elasticity: 209,500 psi when tested in accordance with ASTM D 638.
5) Elongation: 10.2 percent when tested in accordance with ASTM D 638.
6) Nail Hold: 398 lbf/in of penetration when tested in accordance with ASTM D 1761.
7) Screw Hold: 450 lbf/in of penetration when tested in accordance with ASTM D 1761.
8) Screw Hold: 69 lbf/in of penetration when tested in accordance with ASTM D1761.
9) Staple Hold: 69 lbs/in of penetration when tested in accordance with

ASTM D 1761.

10) Gardner Impact: 98 In-lbs when tested in accordance with ASTM D 5420.
11) Notched Izod Impact: 0.270 Ft-lbs/ inch when tested in accordance with ASTM D 256.

2. Thermal:

1) Coefficient of linear Expansion: 3.25 x 10-5 in/in/degrees F when tested in accordance with ASTM D 696.
2) Burning Rate: Failed to ignite when tested in accordance with ASTM D 636.
3) Flame Spread Index: 25 when tested in accordance with ASTM E 84.
4) Heat Deflection Temp: (264 psi): 146 degrees F when tested in accordance with ASTM D 648.
5) Heat Deflection Temp: (66 psi): 153 degrees F when tested in accordance with ASTM D 648.
6) Oil Canning: (@ 140 degrees F: Passed when tested in accordance with ASTM D 648.

3. Manufacturing Tolerances:

a. Variation in component length: Minus 0.00 / plus 1.00.
b. Variation in component width: plus or minus 1/16 inch.
c. Variation in component thickness: plus or minus 1/16 inch.
d. Variation in component edge cut: plus or minus 2 degrees.
e. Variation in Density plus or minus 0.02 grams per cubic centimeter.

4. Workmanship, Finish, and Appearance:

a. Free Foam Cellular PVC that is homogeneous and free of voids, holes, cracks, foreign inclusions and other defects. Edges must be square and top and bottom surfaces be flat with no convex or concave deviation.
b. Uniform surface from cupping, warping, and twisting.

2.3 SIMULATED WOOD TRIM

A. Large Builder Components: PVC/ Vinyl Large Brackets. Most are hollow construction.

1. 0510 Post & Beam:

a. Size: 36 inches by 20 inches by 4-1/2 inches.

2.4 ACCESSORIES

A. Fasteners:

1. Use 12 guage stainless steel fasteners designed for wood trim and siding. Fastener should have sufficient flexural and tensile strength to resist bending.

2. Use fasteners with thin shanks, blunt points, and full round heads that are long enough to penetrate the substrate a minimum of 1-1/2 inches.
3. Do not use staples, small brads and wire nails. Avoid using fine threaded wood screws and rink-shank fasteners.
4. Use standard nail guns with a pressure setting between 7- psi and 100 psi. The recommended pressure depends on type of gun, type of nail, ambient temperature, and the substrate.
5. Pre-drilling is not typically required unless large fasteners are used or the product is installed during temperatures below 40 degrees F.
6. Use two fasteners for every framing member for trim board applications.
7. Install fasteners no more than 2 inches from the end of each board.
8. Avoid fastening simulated wood trim over hollow or uneven areas. Faten onto flat, solid substrates.
9. 3/8 inch and 1.2 inch thick sheet and beadboard is not designed to be ripped and used for trim applications. These products must be glued and mechanically fastened to the substrate.

B. Adhesives:

1. All bonded surfaces must be smooth, clean, and in complete contact with each other for best results.
2. Adhere simulated wood trim to itself with PVC cement or cellular PVC adhesives to prevent joint separation. Acceptable adhesives are Vesatex Fill n'Fasten, IPS Weld-On 705 (White), and IPS Weld-On 4052 (clear), and Trim Tight.
3. PVC cements cure quickly (3-5 minutes or less), and have a limited working time.
4. Scarf joints are recommended where applicable.
5. Bonded joints should be secured with fasteners and fastened with two rows on each side of the joint.

C. Nail Hole Filler: Cortex plug system by Fasten Master.

D. Sealants:

1. Use urethane, polyurethane, polymer blends or acrylic based sealants that do not contain silicone as specified in Section 07910.

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 the manufacturer's instructions.

B. Cutting:

1. Simulated wood trim can be cut using standard wood working saws. Conventional carbide-tipped blades designed for cutting wood are preferred. Avoid using fine-tooth metal-cutting blades.
2. Rough-cut edges are typically caused by excessive friction, poor board support, or worn or improper tooling.

C. Drilling:

1. Simulated wood can be drilled using standard wood working drill bits. Do not use drill bits made for rigid PVC.
2. Avoid frictional heat build-up.
3. Remove shavings periodically from a drill hole as necessary.

D. Milling and Moulding:

1. Simulated wood trim can be milled or moulded using standard milling or moulding machines found in millwork shops.
2. Rake angle 20 to 30 degrees. 25 degrees is recommended.
3. Cutting speed to be optimized with the number of knives and feed rate.

E. Routing:

1. Simulated wood trim can be routed with virtually any piece of equipment used to rout wood.
2. Carbide tipped router bits are recommended.
3. Machinery that allows for multiple cutting speeds will allow you to optimize the process obtaining a smoother finish.

F. Edge Finishing:

1. Traditional sanding, grinding or filling tools used for wood working are preferred.

G. Nail Location:

1. For trim board applications use two fasteners per framing member.
2. Use additional fasteners as required for trim board 8 inches and wider.
3. Install fasteners a maximum of 2 inches from the end of each board.

H. Expansion and Contraction:

1. Simulated wood trim expands and contracts with the changes on temperature. Properly fastening along the entire length is required to minimize expansion and

contraction.

2. Allow 3/16 inch space per 18 foot run of trim for expansion and contraction.
3. Bons joints between pieces of simulated wood trim to eliminate separation.
4. Allow expansions and contraction space at the ends of long runs.

I. Cleaning:

1. Clean simulated wood trim with mild detergent and water.
2. Products with pumice, such as Soft Scrub, may be applied with a nylon brush.
3. For more stubborn stains use a mild household cleaner and degreaser like Clorox Cleanup, Clorox Outdoors, Denatured Alcohol, Bleach, Mr. Clean Magic Eraser or Corte Clean with nylon brush.

J. Painting:

1. Be sure surface to be painted is clean, dry, and free of dirt, loose or peeling paint, mildew, chalk, grease and any other surface contaminants before paint application.
2. Finish all nail holes with hole filler or a UV resistant acrylic caulk,
3. Paint as specified in Section 09900.

    a. Use 100 percent acrylic latex or 100 percent acrylic late with urethane additive paint with a light reflective value(LRV) equal to or greater than 55 units.
    b. Follow the paint manufacturer’s application recommendations.

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 061000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood products.
2. Wood-preservative-treated lumber.
3. Dimension lumber framing.
4. Miscellaneous lumber.
5. Plywood backing panels.

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. NLGA: National Lumber Grades Authority.
2. SPIB: The Southern Pine Inspection Bureau.

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.

1.4 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.**
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** percent.
2. Dimension Lumber: **15 percent for 2-inch nominal thickness or less; 19 percent for more than 2-inch nominal thickness** unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1, Use categories as follows:

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. **Do not use inorganic boron (SBX) for sill plates.**
2. 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.

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

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

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

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

2.3 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.

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.

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 **items indicated on Drawings, and the following:**

1. Concealed blocking.
2. Plywood backing panels.

2.4 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions by Grade: **Construction or No. 2** grade.

1. Application: **All interior partitions**
2. Species:

    a. Southern pine or mixed southern pine; SPIB.
    b. Spruce-pine-fir; NLGA.
    c. Hem-fir; WCLIB, or WWPA.
    d. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
    e. Eastern softwoods; NeLMA.

B. Load-Bearing Partitions by Grade: **No. 2** grade.

1. Application: E**xterior walls and interior load-bearing partitions**.
2. Species:

    a. Southern pine; SPIB.
    b. Douglas fir-larch; WCLIB or WWPA.
    c. Southern pine or mixed southern pine; SPIB.
    d. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
    e. Southern pine; SPIB.
    f. Southern pine or mixed southern pine; SPIB.
    g. Douglas fir-south; WWPA.
    h. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.5 MISCELLANEOUS LUMBER

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

1. Blocking.

B. Dimension Lumber Items: **Construction or No. 2**

1. Spruce-pine-fir; NLGA.

C. Concealed Boards: **15** percent maximum moisture content and the following species and grades:

1. Mixed southern pine or southern pine; No. **2** grade; SPIB.

D. Roofing Nailers: Structural- or No. 2-grade lumber or better; kiln-dried Douglas fir, southern pine, or wood having similar decay-resistant properties.

E. 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.

F. 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, **fire-retardant treated,** in thickness indicated or, if not indicated, not less than **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**.

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

B. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, **butyl rubber** 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 chloropyrifos 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, 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 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 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wall sheathing.
2. Sheathing joint-and-penetration treatment materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for plywood backing panels.
2. Section 071461 "Cold Fluid-Applied Waterproofing" for water-resistive barrier applied over wall sheathing.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Wall sheathing.

B. Product Data Submittals: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency in accordance with ASTM D5516.
4. For products receiving waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. For air-barrier and water-resistant glass-mat gypsum sheathing, include manufacturer's technical data and tested physical and performance properties of products.

C. Shop Drawings: For air-barrier and water-resistant glass-mat gypsum sheathing assemblies.

1. Show locations and extent of sheathing, accessories, and assemblies specific to

Project conditions.

2. Include details for sheathing joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.
3. Include details of interfaces with other materials that form part of air barrier.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: From air-barrier and water-resistant glass-mat gypsum sheathing manufacturer, certifying compatibility of sheathing accessory materials with Project materials that connect to or that come in contact with the sheathing.

B. Product Test Reports: For each air-barrier and water-resistant glass-mat gypsum sheathing assembly, indicating compliance with specified requirements, for tests performed by a qualified testing agency.

C. Field quality-control reports.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing Performance: Air-barrier and water-resistant glass-mat gypsum sheathing assembly, and seals with adjacent construction, are to be capable of performing as a continuous air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies are to be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing , tie-ins to other installed air barriers, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.

2.2 WALL SHEATHING

A. Glass-Mat Gypsum Sheathing, Walls: ASTM C1177/C1177M.

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. CertainTeed; SAINT-GOBAIN

b. Continental Building Products Inc.
c. Georgia-Pacific Gypsum LLC
d. Gold Bond Building Products, LLC provided by National Gypsum Company
e. USG Corporation

2. Type and Thickness: Regular, 1/2 inch thick.
3. Size: 48 by 96 inches for vertical installation.

2.3 FASTENERS

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

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

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. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Paper-Surfaced and Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM C834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum **2 inches** wide, **10 by 10 or 10 by 20 threads/inch**, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. Table 2304.10.1, "Fastening Schedule," in the ICC's International Building Code.
2. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in the ICC's International Residential Code for One- and Two-Family Dwellings.
3. ICC-ES evaluation report for fastener.

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 INSTALLATION OF GYPSUM SHEATHING

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to wood framing with screws.
2. Install panels with a **3/8-inch** gap where non-load-bearing construction abuts structural elements.
3. Install panels with a **1/4-inch** gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent panels without forcing. Abut ends over centers of studs, and stagger end joints of adjacent panels not less than one stud spacing. Attach at perimeter and within field of panel to each stud.

1. Space fasteners approximately **8 inches** o.c. and set back a minimum of **3/8 inch** from edges and ends of panels.

D. Vertical Installation: Install vertical edges centered over studs. Abut ends and edges with those of adjacent panels. Attach at perimeter and within field of panel to each

stud.

1. Space fasteners approximately **8 inches** o.c. and set back a minimum of **3/8 inch** from edges and ends of panels.
2. For sheathing under stucco cladding, panels may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.

E. Seal sheathing joints in accordance with sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

F. Air-Barrier and Water-Resistant Glass-Mat Gypsum Sheathing:

1. Install accessory materials in accordance with sheathing manufacturer's written instructions and details to form a seal with adjacent construction, to seal fasteners, and ensure continuity of air and water barrier.

    a. Coordinate the installation of sheathing with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
    b. Install transition strip on roofing membrane or base flashing, so that a minimum of **3 inches** of coverage is achieved over each substrate.

2. Connect and seal sheathing material continuously to air barriers specified under other Sections as well as to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.
3. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
4. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply transition strip, so that a minimum of **3 inches** of coverage is achieved over each substrate. Maintain **3 inches** of full contact over firm bearing to perimeter frames, with not less than **1 inch** of full contact.

    a. Transition Strip: Roll firmly to enhance adhesion.

5. Fill gaps in perimeter frame surfaces of windows, curtain walls, storefronts, doors, and miscellaneous penetrations of sheathing material with foam sealant.
6. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.

7. Seal top of through-wall flashings to sheathing with an additional **6-inch-** wide, transition strip.
8. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counter flashings or ending in reglets with termination mastic.
9. Repair punctures, voids, and deficient lapped seams in strips and transition strips extending **6 inches** beyond repaired areas in strip direction.

3.3 FIELD QUALITY CONTROL

A. ABAA Quality Assurance Program: Perform examinations, preparation, installation, testing, and inspections under ABAA's Quality Assurance Program.

B. Air barriers will be considered defective if they do not pass tests and inspections.

C. Repair damage to air barriers caused by testing; follow manufacturer's written instructions.

D. Prepare test and inspection reports.

END OF SECTION 061600

SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Wood roof trusses.
2. Wood girder trusses.

1.2 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses.

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

1.3 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.

1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.
2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program, complies with quality-control procedures in TPI 1, and involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction .

1.4 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in SBCA BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

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-plate-connected wood trusses.

B. Comply with applicable requirements and recommendations of TPI 1, TPI DSB, and SBCA BCSI.

C. Wood Structural Design Standard: Comply with applicable requirements in AF&PA's "National Design Specifications for Wood Construction" and its "Supplement."

2.2 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of any rules-writing agency certified by the American Lumber Standard Committee (ALSC) Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Provide dry lumber with 19 percent maximum moisture content at time of dressing.

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Section 061000 "Rough Carpentry."

2.3 FASTENERS

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

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.
2. Where trusses are exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153/A153M.

B. Nails, Brads, and Staples: ASTM F1667.

2.4 FABRICATION

A. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly, with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

B. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

F. Securely connect each truss ply required for forming built-up girder trusses.

G. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Section 061000 "Rough Carpentry."
2. Install and fasten strongback bracing vertically against vertical web of parallel-chord floor trusses at centers indicated.

H. Install wood trusses within installation tolerances in TPI 1.

I. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

J. Replace wood trusses that are damaged or do not comply with requirements.

END OF SECTION 061753

SECTION 064116 - PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

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.

1.2 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.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data:

1. Plastic-laminate-clad architectural cabinets.
2. Cabinet hardware and accessories.
3. Miscellaneous materials.

B. Product Data Submittals: For each product.

C. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.
2. Show large-scale details.
3. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
4. Show locations and sizes of cutouts and holes for items installed in plastic-laminate architectural cabinets.

D. Samples: For each exposed product and for each color and texture specified, in manufacturer's or manufacturer's standard size.

E. Samples for Initial Selection: For each type of exposed finish.

F. Samples for Verification: For the following:

1. Plastic Laminates: 8 by 10 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.

2. Exposed Cabinet Hardware and Accessories: One full-size unit for each type and finish.

1.5 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.

1.6 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. 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.

C. 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 PLASTIC-LAMINATE-CLAD ARCHITECTURAL CABINETS

A. Quality Standard: Unless otherwise indicated, comply with the Architectural Woodwork Standards for grades of cabinets indicated for construction, finishes, installation, and other requirements.

1. The Contract Documents contain requirements that are more stringent than the referenced quality standard. Comply with requirements of Contract Documents in addition to those of the referenced quality standard.

B. Architectural Woodwork Standards Grade: Premium.

C. Type of Construction: Frameless.

D. Door and Drawer-Front Style: **Flush** overlay.

1. Reveal Dimension: 1/2 inch.

E. High-Pressure Decorative Laminate: ISO 4586-3, grades as indicated or if not indicated, as required by quality standard.

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. ABET Inc.
b. Formica Corporation
c. Laminart LLC
d. Pionite; a Panolam Industries International, Inc. brand
e. Wilsonart LLC

F. Exposed Surfaces:

1. Plastic-Laminate Grade: HGS VGS HGP.
2. Edges: Grade HGS Grade VGS.
3. Pattern Direction: As indicated.

G. Semi exposed Surfaces:

1. Surfaces Other Than Drawer Bodies: Thermally fused laminate panels.

a. Edges of Plastic-Laminate Shelves: PVC edge banding, 3.0 mm thick, matching laminate in color, pattern, and finish.
b. Edges of Thermally Fused Laminate Panel Shelves: PVC or polyester edge banding.
c. For semi exposed backs of panels with exposed plastic-laminate surfaces, provide surface of high-pressure decorative laminate, ISO 4586-3, grade to match exposed surface.

2. Drawer Sides and Backs: Solid-hardwood lumber.
3. Drawer Bottoms: Hardwood plywood.

H. Dust Panels: **1/4-inch** plywood or tempered hardboard above compartments and drawers unless located directly under tops.

I. Concealed Backs of Panels with Exposed Plastic-Laminate Surfaces: High-pressure decorative laminate, ISO 4583-3, grade to match exposed surface.

J. Drawer Construction: Fabricate with exposed fronts fastened to sub front with mounting screws from interior of body.

1. Join sub fronts, backs, and sides with glued rabbeted joints supplemented by mechanical fasteners or glued dovetail joints.

K. 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, matte finish.
b. Solid colors with core same color as surface, matte finish.
c. Wood grains, gloss finish.
d. Patterns, matte finish.

2.2 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.

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. Medium-Density Fiberboard (MDF): ANSI A208.2, Grade 130.
2. Particleboard (Medium Density): ANSI A208.1, Grade M-2-Exterior Glue.
3. Softwood Plywood: DOC PS 1, medium-density overlay.
4. Thermally Fused Laminate (TFL) Panels: Particleboard or MDF finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of ISO 4586.

2.3 CABINET HARDWARE AND ACCESSORIES

A. Frameless Concealed Hinges (European Type): ANSI/BHMA A156.9, B01602, 135 degrees of opening, self-closing.

B. Back-Mounted Pulls: ANSI/BHMA A156.9, B02011.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Catches: Magnetic catches, ANSI/BHMA A156.9, B03141.

E. Adjustable Shelf Standards and Supports: ANSI/BHMA A156.9, B04071; with shelf rests, B04081.

F. Shelf Rests: ANSI/BHMA A156.9, B04013; two-pin plastic with shelf hold-down clip.

G. Drawer Slides: ANSI/BHMA A156.9.

1. Standard Duty (Grade 1 and Grade 2): Side mount.
2. Heavy-Duty (Grade 1HD-100 and Grade 1HD-200): Side mount.

    a. Type: Full extension.
    b. Material: Galvanized steel ball bearing slides.
    c. Motion Feature: Soft close dampener.

3. Pencil drawers not more than **3 inches** high and not more than **24 inches** wide, provide 50 lb load capacity.
4. 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 load capacity.
5. File drawers more than **6 inches** high or more than **24 inches** wide, provide 100 lb load capacity.
6. Lateral file drawers more than **6 inches** high and more than **30 inches** wide, provide 200 lb load capacity.
7. Computer keyboard tray, provide 75 lb load capacity.

H. Door Locks: ANSI/BHMA A156.11, E07121.

I. Drawer Locks: ANSI/BHMA A156.11, E07041.

J. Door and Drawer Silencers: ANSI/BHMA A156.16, L03011.

K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with ANSI/BHMA A156.18 for ANSI/BHMA finish number indicated.

L. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in ANSI/BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: 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 and at floors.

2.5 FABRICATION

A. Fabricate architectural cabinets to dimensions, profiles, and details indicated.

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 the 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 GANA's "Glazing Manual."

1. For glass in frames, secure glass with removable stops.
2. For exposed glass edges, polish and grind smooth.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition cabinets to humidity conditions in installation areas for not less than 72 hours.

3.2 INSTALLATION

A. Architectural Woodwork Standards Grade: Install cabinets to comply with quality standard grade of item to be installed.

B. Assemble cabinets and complete fabrication at Project site to extent that it was not completed in the shop.

C. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with wafer-head cabinet installation screws.

D. 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. Fasten wall cabinets through back, near top and bottom, and at ends not more than **16 inches** o.c. with No. 10 wafer-head screws sized for not less than 1-1/2-inch penetration into wood framing, blocking, or hanging strips.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective cabinets, where possible, to eliminate functional and visual defects. Where not possible to repair, replace architectural cabinets. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean cabinets on exposed and semi exposed surfaces.

END OF SECTION 064116

SECTION 071416 - COLD FLUID-APPLIED WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silyl-Terminated-Polymer waterproofing.
2. Accessory waterproofing system materials.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.2 DEFINITIONS

A. Compatible: Material that will not adversely affect adjacent materials, is chemically compatible with adjacent materials, and where required for bond, achieves adhesive compatibility with adjacent materials.

B. Chemical Compatibility: Material that will not break down, deteriorate, degrade, or prematurely fail when in contact with another material. Material that will not cause chemical breakdown, deterioration, degradation, staining, or premature failure of another material.

C. Adhesive Compatibility: Material that will develop bond strength or provide a suitable surface for another material to develop bond strength complying with requirements when in contact with another material.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings:

1. Indicate locations and extent of waterproofing.
2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, expansion-joint conditions, tie-ins with adjoining waterproofing, and other termination conditions.
3. Include setting drawings indicating layout, sizes, sections, profiles, and joint

details of pedestal-supported concrete pavers.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer. Protect stored materials in accordance with manufacturer's written instructions.

B. Remove and replace materials that cannot be applied within their stated shelf life.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to frozen, damp, or wet substrates, when relative humidity exceeds 85 percent, or when temperatures are less than **5 deg F** above dew point.
2. Do not apply waterproofing when snow, rain, fog, or mist are present, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.7 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or remove and replace waterproofing that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Waterproofing System: Obtain waterproofing materials and protection course molded-sheet drainage panels insulation drainage panels from same manufacturer as waterproofing membrane.

2.2 POLYETHER WATERPROOFING

A. STPE Waterproofing: Single-component, silyl-terminated polyether complying with

ASTM C836/C836M.

1. Basis-of-Design Product: Subject to compliance with requirements, provide PROSOCO R-GUARD CAT 5 or comparable product by one of the following:

   a. W. R. Meadows, Inc

2. Tensile Strength: **>100 psi** minimum; ASTM D638.
3. Elongation at Break:>400 percent minimum; ASTM D638.
4. Water Vapor Permeance: **0.1 perm**, maximum, ASTM E96/E96M.
5. Hydrostatic-Head Resistance: [**200 ft.**] of water, minimum; ASTM D5385/D5385M.

2.3 ACCESSORY WATERPROOFING SYSTEM MATERIALS

A. General: Accessory materials as recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

B. Sheet Flashing: Manufacturer's standard flashing sheet.

   1. Adhesive: Manufacturer's standard contact adhesive.

C. Metal Termination Bars: Manufacturer's standard, predrilled, stainless steel or aluminum termination bars; approximately **1 by 1/8 inch** thick; with stainless steel anchors.

D. Detailing Seam Tape: Manufacturer's standard detailing tape.

E. Joint Sealant: Single-component polyurethane sealant, compatible with waterproofing; as specified in Section 079200 "Joint Sealants"; and as recommended in writing by waterproofing manufacturer for substrate and joint conditions.

F. Backer Rod: Closed-cell polyethylene foam.

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 concrete has cured and aged for minimum time period as recommended in writing by waterproofing manufacturer.
   2. Verify that substrate is visibly dry and within the moisture limits as recommended in writing by waterproofing manufacturer. Test for capillary moisture by plastic sheet method in accordance with ASTM D4263.

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

3.2 PREPARATION

A. Clean, prepare, and treat substrates in accordance with waterproofing manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate in accordance with ASTM D4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces in accordance with ASTM D4258.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

F. Coordinate with Owner for impact to air-intake equipment in the vicinity of the Work. Cover or filter air-intake louvers before proceeding with work that could affect indoor air quality or that could activate smoke detectors in the ductwork.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners in accordance with waterproofing manufacturer's written instructions and to recommendations in ASTM C898/C898M.

3.4 TREATMENT OF JOINTS AND CRACKS

A. Prepare, treat, rout, and fill joints and cracks in substrate in accordance with waterproofing manufacturer's written instructions and recommendations in ASTM C898/C898M. Before coating surfaces, remove dust and dirt from joints and cracks in accordance with ASTM D4258.

1. Comply with ASTM C1193 for joint-sealant installation.
2. Apply bond breaker on sealant surface, beneath preparation strip.
3. Prime substrate along each side of joint and apply a single thickness of preparation strip at least **6 inches** wide along each side of joint. Apply waterproofing in two separate applications and embed a joint-reinforcing strip in first preparation coat.

B. Install sheet flashing and bond to deck and wall substrates where required in accordance with waterproofing manufacturer's written instructions.

1. Extend sheet flashings for 4 inches onto perpendicular surfaces and items penetrating substrate.

3.5 INSTALLATION OF COLD FLUID-APPLIED WATERPROOFING

A. General: Apply waterproofing in accordance with manufacturer's written instructions and to recommendations in ASTM C898/C898M.

B. Start installing waterproofing in presence of manufacturer's technical representative.

C. Apply primer over prepared substrate at manufacturer's recommended rate and allow it to dry.

D. Unreinforced Waterproofing Membrane Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a minimum dry film thickness of 60 mils.
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every **100 sq. ft.**.

E. Reinforced Waterproofing Membrane Applications: Mix materials and apply waterproofing by roller, notched squeegee, trowel, or other suitable application method.

1. Apply first coat of waterproofing, embed membrane-reinforcing fabric, and apply second coat of waterproofing to completely saturate reinforcing fabric and to obtain a seamless reinforced membrane free of entrapped gases and pinholes, with an average dry film total thickness of 70 mils.
2. Apply reinforced waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every **100 sq. ft.**.

F. Cure waterproofing, taking care to prevent contamination and damage to membrane.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Protect waterproofing system from damage and wear during remainder of construction period.

B. Correct deficiencies in or remove waterproofing system that does not comply with requirements, repair substrates, and repair or reinstall waterproofing system to a condition free of damage and deterioration at time of Substantial Completion and in accordance with warranty requirements.

END OF SECTION 071416

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Polyisocyanurate foam-plastic board insulation.
2. Glass-fiber blanket insulation.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for insulation installed in masonry cells.
2. Section 071416 "Cold Fluid-Applied Waterproofing"
3. Section 072119 "Foamed-in-Place Insulation" for spray-applied polyurethane foam insulation.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of 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 POLYISOCYANURATE FOAM-PLASTIC BOARD INSULATION

A. Polyisocyanurate Board Insulation, Glass-Fiber-Mat Faced: ASTM C1289, glass-fiber-mat faced, Type II, Class 2.

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. Atlas Polyiso Roof and Wall Insulation
b. Carlisle Coatings & Waterproofing Inc
c. Elevate; Holcim Building Envelope
d. Hunter Panels; a Carlisle company
e. Johns Manville; a Berkshire Hathaway company

2.2 GLASS-FIBER BLANKET INSULATION

A. Glass-Fiber Blanket Insulation, Unfaced: ASTM C665, Type I; passing ASTM E136 for combustion characteristics.

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. CertainTeed; SAINT-GOBAIN
b. Johns Manville; a Berkshire Hathaway company
c. Knauf Insulation
d. Owens Corning

2.3 INSULATION FASTENERS

A. Insulation Fastener Accessories: Provide double-pointed weld pins, lagging pins, quilting pins, duct liner pins, insulation hangers, specialty washers, special caps, j-hooks, capacitor discharge annular weld pins, capacitor discharge acoustical lagging pins, and other accessory materials that are recommended in writing by insulation fastener manufacturer to produce complete insulation supports.

2.4 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.

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. 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.
3. Tapes for Reflective Insulation and Barriers:

a. Reinforced-foil tape for sealing tears or cuts in sheet vapor barrier.

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 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."

3.4 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. 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.
6. 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.

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. 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.

3.5 INSTALLATION OF BOARD INSULATION

A. Install board insulation in accordance with manufacturer's written instructions per project applications and conditions.

3.6 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 072100

SECTION 072119 - FOAMED-IN-PLACE INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Open-cell spray polyurethane foam insulation.
2. Accessories.

B. Related Requirements:

1. Section 072100 "Thermal Insulation" for foam-plastic board insulation.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Closed-cell spray polyurethane foam insulation.
2. Accessories.

1.3 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each product, for tests performed by qualified testing agency.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

PART 2 - PRODUCTS

2.1 OPEN-CELL SPRAY POLYURETHANE FOAM INSULATION

A. Open-Cell Spray Polyurethane Foam: Spray-applied polyurethane foam using water as a blowing agent. Minimum density of 0.4 lb/cu. ft. and minimum aged R-value at **1-inch** thickness of **3.4 deg F x h x sq. ft./Btu at 75 deg F**.

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. AMBIT Polyurethane
b. Carlisle Spray Foam Insulation
c. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands)
d. Johns Manville; a Berkshire Hathaway company
e. Thermoseal USA

2. 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: 25 or less.
b. Smoke-Developed Index: 450 or less.

3. Fire Propagation Characteristics: Passes NFPA 285 and NFPA 276 testing as part of an approved assembly.

2.2 ACCESSORIES

A. Primer: Material recommended by insulation manufacturer where required for adhesion of insulation to substrates.

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrates are clean, dry, and free of substances that are harmful to insulation.

B. Priming: Prime substrates where recommended by insulation manufacturer. Apply primer to comply with insulation manufacturer's written instructions. Confine primers to areas to be insulated; do not allow spillage or migration onto adjoining surfaces.

3.2 INSTALLATION

A. Comply with insulation manufacturer's written instructions applicable to products and applications.

B. Spray insulation to envelop entire area to be insulated and fill voids.

C. Apply in multiple passes to not exceed maximum thicknesses recommended by manufacturer. Do not spray into rising foam.

D. Framed Construction: Install into cavities formed by framing members to achieve thickness indicated on Drawings.

E. Miscellaneous Voids: Apply according to manufacturer's written instructions.

F. Install thermal barrier material.

1. Do not cover insulation prior to any required spray foam insulation inspections.

G. Apply barrier coatings in accordance with manufacturer's written instructions and to comply with requirements for listing and labeling for fire-propagation characteristics and surface-burning characteristics specified.

1. Use equipment and techniques best suited for substrate and type of material applied as recommended by coating manufacturer.
2. Apply coatings to prepared surfaces as soon as practical after preparation and before subsequent surface soiling or deterioration.
3. 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.

3.3 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect spray foam insulation installation, including accessories. Report results in writing.

END OF SECTION 072119

SECTION 073113 - ASPHALT SHINGLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass-fiber-reinforced asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Metal flashing and trim.

1.2 PREINSTALLATION MEETINGS

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

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Asphalt shingles.
2. Underlayment materials.
3. Ridge vents.
4. Asphalt roofing cement.
5. Elastomeric flashing sealant.

B. Shop Drawings: For metal flashing and trim.

C. Samples: For each exposed product and for each color and blend specified, in sizes indicated.

1. Asphalt Shingles: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: **12-inch-** long Sample.
4. Exposed Valley Lining: **12 inches** square.

D. Samples for Initial Selection:

1. For each type of asphalt shingle indicated.
2. For each type of accessory involving color selection.

E. Samples for Verification: For the following products, in sizes indicated:

1. Asphalt Shingles: Full size.
2. Ridge and Hip Cap Shingles: Full size.
3. Ridge Vent: **12-inch-** long Sample.

4. Exposed Valley Lining: **12 inches** square.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each type of asphalt shingle and underlayment product indicated, for tests performed by manufacturer and witnessed by a qualified testing agency

C. Research Reports: For synthetic underlayment, from ICC-ES, indicating that product is suitable for intended use under applicable building codes.

D. Sample Warranty: For manufacturer's materials warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For asphalt shingles to include in maintenance manuals.

B. Materials warranties.

C. Roofing Installer's warranty.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An authorized installer who is trained and approved by manufacturer.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

1. Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

1.8 WARRANTY

A. Materials Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Manufacturing defects.

2. Materials Warranty Period: **25** years from date of Substantial Completion.
3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to **100 mph** for **15** years from date of Substantial Completion.
4. Algae-Resistance Warranty Period: Asphalt shingles will not discolor for **25** years from date of Substantial Completion.
5. Workmanship Warranty Period: **Two** years from date of Substantial Completion.

B. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Two** years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain each type of product from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

B. Wind Resistance: Provide asphalt shingles that comply with requirements of ASTM D3161/D3161M, Class F, and with ASTM D7158/D7158M, Class H.

C. Energy Performance, ENERGY STAR: Provide asphalt shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.

2.3 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

A. Impact-Resistant, Laminated-Strip Asphalt Shingles: ASTM D3462/D3462M, laminated, multi-ply overlay construction; glass-fiber reinforced, mineral-granule surfaced, and self-sealing; with impact resistance complying with UL 2218, Class 4.

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

a. **Atlas Molded Products, a division of Atlas Roofing Corporation**
b. **Building Products of Canada Corp.**
c. **CertainTeed; SAINT-GOBAIN**
d. **GAF**
e. **Malarkey Roofing Products**

2. Butt Edge: **Straight** cut.
3. Strip Size: **Manufacturer's standard**
4. Algae Resistance: Granules resist algae discoloration.
5. Color and Blends: **As selected by Architect from manufacturer's full range**

B. Hip and Ridge Shingles: **Manufacturer's standard units to match asphalt shingles**

2.4 UNDERLAYMENT MATERIALS

A. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.

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

a. **ALCO Products LLC**
b. **Atlas Polyiso Roof and Wall Insulation**
c. **Building Products of Canada Corp.**
d. **CertainTeed; SAINT-GOBAIN**
e. **Drexel Metals Corp.**
f. **G.A.P. Roofing, Inc.**
g. **GAF**
h. **GCP Applied Technologies Inc.**
i. **IKO Industries Inc.**
j. **Malarkey Roofing Products**
k. **Owens Corning**]
l. **SDP Advanced Polymer Products Inc.**
m. **SystemComponents Corporation**]
n. **Tamko Building Products LLC**]

2.5 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.

B. Elastomeric Flashing Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag, elastomeric polymer sealant; of class and use classifications required to seal joints and remain watertight; recommended in writing by manufacturer for installation of flashing systems.

C. Roofing Nails: ASTM F1667, aluminum, stainless steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum **0.120-inch-** diameter, sharp-pointed, with a **3/8- to 7/16-inch-** diameter flat head and of sufficient length to penetrate **3/4 inch** into solid wood decking or extend at least **1/8 inch** through sheathing less than **3/4 inch** thick.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

D. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, **1-inch-** minimum diameter.

1. Provide with minimum **0.0134-inch-** thick metal cap, **0.010-inch-** thick power-driven metal cap, or **0.035-inch-** thick plastic cap; and with minimum **0.083-inch-** thick ring shank or **0.091-inch-** thick smooth shank of length to penetrate at least **3/4 inch** into roof sheathing or to penetrate through roof sheathing less than **3/4 inch** thick.

2.6 METAL FLASHING AND TRIM

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item unless otherwise specified in this Section or indicated on Drawings.

1. Drip Edges: Fabricate in lengths not exceeding **10 feet** with minimum **2-inch** roof-deck flange and **1-1/2-inch** fascia flange with **3/8-inch** drip at lower edge.
2. Vent-Pipe Flashings: ASTM B749, Type L51121, at least **1/16 inch** thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof, and extending at least **4 inches** from pipe onto roof.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNDERLAYMENT MATERIALS

A. Comply with asphalt shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.

1. Single-Layer Installation:

a. Lap sides a minimum of **4 inches** over underlying course.
b. Lap ends a minimum of **4 inches**.
c. Stagger end laps between succeeding courses at least **72 inches**.

B. Synthetic Underlayment:

1. Install on roof deck parallel with and starting at the eaves.

a. Lap sides and ends as recommended in writing by manufacturer, but not less than **4 inches** for side laps and **6 inches** for end laps.
b. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than **72 inches**.
c. Fasten with underlayment nails in accordance with manufacturer's written instructions.

d. Cover underlayment within period recommended in writing by manufacturer.

2. Install in single layer on roofs sloped at 4:12 and greater.
3. Install in double layer on roofs sloped at less than 4:12.
4. Install synthetic underlayment **on roof deck not covered** by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

   a. Lap sides of underlayment over self-adhering sheet not less than **4 inches** in direction to shed water.
   b. Lap ends of underlayment not less than **6 inches** over self-adhering sheet.

5. Install fasteners in a grid pattern of **12 inches** between side laps with **6-inch** spacing at side and end laps.
6. Terminate synthetic underlayment **extended up not less than 4 inches** against sidewalls, curbs, chimneys, and other roof projections.

C. Granular-Surfaced, Concealed Valley Lining: For **woven** valleys. Comply with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

1. Lap roof-deck underlayment over valley lining at least **6 inches**.
2. Install a **36-inch-** wide strip of granular-surfaced valley lining, with granular-surface face up, centered in valley and fastened to roof deck.
3. Lap ends of strips at least **12 inches** in direction to shed water, and seal with asphalt roofing cement.
4. Fasten to roof deck.

D. Metal-Flashed, Open-Valley Underlayment: Install two layers of minimum **36-inch-** wide underlayment centered in valley.

1. Use same underlayment as installed on field of roof.
2. Stagger end laps between layers at least **72 inches**.
3. Lap ends of each layer at least **12 inches** in direction that sheds water, and seal with asphalt roofing cement.
4. Fasten each layer to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.
5. Lap roof-deck underlayment over first layer of valley underlayment at least **6 inches**.

E. Granular-Surfaced, Open-Valley Lining: Before installing valley lining, install **36-inch-** wide felt underlayment centered in valley. Fasten to roof deck with **underlayment** nails.

1. Lap roof-deck felt underlayment over valley felt underlayment at least **6 inches**.
2. Install an **18-inch-** wide strip of valley lining centered in valley, with granular-surface face down.
3. Install a second **36-inch-** wide strip of valley lining centered in valley, with granular-surface face up.
4. Lap ends of each strip at least **12 inches** in direction to shed water, and seal with

asphalt roofing cement.
5. Stagger end laps between succeeding strips at least **72 inches**.
6. Fasten each strip to roof deck.

3.2 INSTALLATION OF METAL FLASHING AND TRIM

A. Install metal flashings and trim to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

1. Install metal flashings in accordance with recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."
2. Bed flanges of metal flashings using asphalt roofing cement or elastomeric flashing sealant.

B. Apron Flashings: Extend lower flange over and beyond each side of downslope asphalt shingles and up the vertical surface.

C. Step Flashings: Install with a head lap of **2 inches** and extend over underlying shingle and up the vertical face.

1. Install with lower edge of flashing just upslope of, and concealed by, butt of overlying shingle.
2. Fasten to roof deck only.

D. Cricket and Backer Flashings: Install against roof-penetrating elements extending concealed flange beneath upslope asphalt shingles and beyond each side.

E. Counter flashings: Coordinate with installation of base flashing and fit tightly to base flashing. Lap joints a minimum of **4 inches** secured in a waterproof manner.

1. Install in reglets or receivers.

F. Open-Valley Flashings: Install centered in valleys, lapping ends at least **8 inches** in direction that sheds water. Fasten upper end of each length to roof deck beneath overlap.

1. Secure hemmed flange edges into metal cleats spaced **12 inches** apart and fastened to roof deck.
2. Adhere minimum **9-inch-** wide strips of self-adhering, polymer-modified bitumen sheet to metal flanges and to underlying self-adhering sheet, polymer-modified bitumen sheet.

    a. Place strips parallel to and over flanges so that they will be just concealed by installed shingles.

3. Provide a closure at the end of the inverted-V profile of the valley metal to minimize water and ice infiltration.

G. Rake Drip Edges: Install over underlayment materials and fasten to roof deck.

H. Eave Drip Edges: Install below underlayment materials and fasten to roof deck.

I. Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.3 INSTALLATION OF ASPHALT SHINGLES

A. Install asphalt shingles in accordance with manufacturer's written instructions and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip **with tabs removed at least 7 inches wide** with self-sealing strip face up at roof edge.

1. Extend asphalt shingles **3/4 inch** over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of laminated asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Fasten asphalt shingle strips with a minimum of **six** roofing nails, but not less than the number indicated in manufacturer's written instructions for roof slope and design wind speed indicated on Drawings and for warranty requirements specified in this Section.

1. Locate fasteners in accordance with manufacturer's written instructions.
2. Where roof slope exceeds 18:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
3. Where roof slope is less than 4:12, hand seal self-sealing asphalt shingles to improve the shingles' positive bond by applying asphalt roofing cement spots between course overlaps after nailing the upper course.
4. When ambient temperature during installation is below **50 deg F** hand seal self-sealing asphalt shingles by applying asphalt roofing cement spots between course overlaps after nailing the upper course.

E. Woven Valleys: Extend succeeding asphalt shingle courses from both sides of valley **12 inches** beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in valley.

1. Do not nail asphalt shingles within **6 inches** of valley center.

F. Ridge Vents: Install continuous ridge vents over asphalt shingles in accordance with manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing-shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds.

1. Fasten with roofing nails of sufficient length to penetrate sheathing.
2. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

SECTION 074646 - FIBER-CEMENT SIDING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fiber-cement siding.
2. Fiber-cement soffit.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood furring, grounds, nailers, and blocking.

1.2 COORDINATION

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

1.3 ACTION SUBMITTALS

A. Product Data:

1. Fiber-cement siding.
2. Fiber-cement soffit panel.

B. Product Data Submittals: For each type of fiber-cement siding. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

C. Samples for Initial Selection: For fiber-cement siding including related accessories.

D. Samples for Verification: For each type, color, texture, and pattern required.

1. **12-inch-** long-by-actual-width Sample of siding.
2. **12-inch-** long-by-actual-width Samples of trim and accessories.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of fiber-cement siding and soffit panels.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for fiber-cement siding.

C. Research/Evaluation Reports: For each type of fiber-cement siding required, from ICC-ES.

D. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with labels intact until time of use.

B. Store materials on elevated platforms, under cover, and in a dry location.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including cracking and deforming.
b. Deterioration of materials beyond normal weathering.

2. Warranty Period: 30 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain products, including related accessories, from single source from single manufacturer.

2.2 FIBER-CEMENT LAP SIDING

A. Fiber-Cement Siding: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame-spread index of 25 or less when tested in accordance with ASTM E84.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Hardie Plank Lap Siding – Select Cedarmill or comparable product by one of the following:

a. James Hardie Building Products, Inc.

B. Labeling: Provide fiber-cement siding that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than **5/16 inch**.

D. Nominal Width: **7.25-inch-** wide sheets, Exposure width 6 inch.

E. Factory Priming: Manufacturer's standard acrylic primer.

2.3 FIBER-CEMENT PANEL

A. Fiber-cement Siding: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E136; with a flame -spread index of 25 or less when tested in accordance with ASTM E84.

1. Basis of Design Product: Subject to compliance with requirements, provide Hardie Architectural Panel – Fine Snad or compatible product by one of the following:

a. James Hardie Building Products, Inc.

B. Labeling: provide fiber-cement siding that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than 5/16 inch.

D. Panel Texture: 48 inch wide sheets with Fine Sand texture.

E. Factory Priming: manufacturer’s standard acrylic primer.

2.4 FIBER-CEMENT SOFFIT PANEL

A. Fiber Cement Soffit Panel: ASTM C1186, Type A, Grade II, fiber-cement board, noncombustible when tested in accordance with ASTM E126; with a flame spread index of 25 or less when tested in accordance with ASTM E84.

1. Basis-of Design Product: Subject to compliance with requirements, provide Hardie Soffit –Cedarmill or comparable product by one of the following:

a. James Hardie Building Products, Inc.

B. Labeling: Provide fiber-cement soffit panel that is tested and labeled in accordance with ASTM C1186 by a qualified testing agency acceptable to authorities having jurisdiction.

C. Nominal Thickness: Not less than .25 inch.

D. Nominal Panel Width: 16.00 inches

E. Factory priming: Manufacturer’s standard acrylic primer.

2.5 ACCESSORIES

A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside

corner caps, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories matching color and texture of adjacent siding unless otherwise indicated.

B. Decorative Accessories: Provide the following fiber-cement decorative accessories as indicated:

1. Corner posts.
2. Door and window casings.
3. Fasciae.
4. Moldings and trim.

C. Flashing: Provide Galvanized flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

D. Fasteners:

1. For fastening to wood, use siding nails of sufficient length to penetrate a minimum of **1 inch** into substrate.
2. For fastening fiber cement, use stainless steel fasteners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of fiber-cement siding and related accessories.

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

3.2 PREPARATION

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

3.3 INSTALLATION

A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

1. Do not install damaged components.
2. Install fasteners no more than 8 inches o.c.

B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

3.4 ADJUSTING AND CLEANING

A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.

B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Custom flashing and trim fabrications, made from the following:

1. Sheet metal materials.
2. Underlayment.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashings.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

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

1. Plans, elevations, sections, and attachment details.
2. Fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled Work.
3. Identification of material, thickness, weight, and finish for each item and location in Project.
4. Details for forming, including profiles, shapes, seams, and dimensions.
5. Details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Details of termination points and assemblies.
7. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Details of roof-penetration flashing.
9. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, flashings, and counterflashing.
10. Details of special conditions.

C. Samples: For each exposed product and for each color and texture specified, **12 inches** long by actual width.

D. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

E. Samples for Verification: Actual sample of finished products for each type of exposed finish for sheet metal and other metal accessories.

1. Sheet Metal Flashing and Trim: Manufacturers' standard size. Include finished seam with required profile. Include fasteners, cleats, clips, closures, and other attachments.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates: For each type of coping and roof edge flashing that is ANSI/SPRI/FM 4435/ES-1 tested.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Qualification Statements: For fabricator.

D. Sample warranties.

1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Entity that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. For roof edge flashings and copings that are ANSI/SPRI/FM 4435/ES-1 tested shop is to be listed as able to fabricate required details as tested and approved.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.6 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes

within specified warranty period.

1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners, are to withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim are not to rattle, leak, or loosen, and are to remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: Architectural Metal Flashing, Condensation and Air Leakage Control, and Reroofing" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

C. SPRI Wind Design Standard: Manufacture and install roof edge flashings and copings tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: 22.6 psf - 140.3 psf.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METAL MATERIALS

A. Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with minimum ASTM A653/A653M, **G90** coating designation Pre-painted by the coil-coating process to comply with ASTM A755/A755M.

1. Surface: Smooth, flat.
2. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: Fluoropolymer finish containing not less than 70 percent 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

3. Color: As selected by Architect from manufacturer's full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored

acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of **0.5 mil**.

C. Lead Sheet: ASTM B749 lead sheet.

2.3 UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of **30 mils** thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

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

a. Carlisle WIP Products; a brand of Carlisle Construction Materials
b. Henry, a Carlisle Company (formerly Henry Company and Carlisle Coatings & Waterproofing Inc. brands)
c. Owens Corning
d. Polyglass U.S.A., Inc.

2.4 MISCELLANEOUS MATERIALS

A. Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
b. Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.
c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

2. Fasteners for Zinc-Coated (Galvanized) or Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153/A153M or ASTM F2329/F2329M.
3. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
4. Fasteners for Stainless Steel Sheet: Series 300 stainless steel.

C. Solder:

1. For Zinc-Coated (Galvanized) Steel: ASTM B32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
2. For Stainless Steel: ASTM B32, Grade Sn60, with acid flux of type recommended by stainless steel sheet manufacturer.

D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape **1/2 inch** wide and **1/8 inch** thick.

E. Elastomeric Sealant: ASTM C920, elastomeric polyurethane silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

G. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

H. Bituminous Coating: Cold-applied asphalt emulsion in accordance with ASTM D1187/D1187M.

I. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

J. Reglets: Units of type, material, and profile required, formed to provide secure interlocking of separate reglet and counterflashing pieces, and compatible with flashing indicated with factory-mitered and -welded corners and junctions and with interlocking counterflashing on exterior face, of same metal as reglet.

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. Cheney Flashing Company
   b. Fry Reglet Corporation
   c. Heckmann Building Products, Inc.
   d. Hohmann & Barnard, Inc
   e. Metal-Era, Inc.

2. Material: Galvanized steel, 0.022 inch thick.
3. Surface-Mounted Type: Provide with slotted holes for fastening to substrate, with neoprene or other suitable weatherproofing washers, and with channel for sealant at top edge.
4. Masonry Type: Provide with offset top flange for embedment in masonry mortar joint.
5. Accessories:

a. 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 Drawings show reglet without metal counterflashing.
b. Counterflashing Wind-Restraint Clips: Provide clips to be installed before counterflashing to prevent wind uplift of counterflashing's lower edge.

6. Finish: With manufacturer's standard color coating.

2.5 FABRICATION, GENERAL

A. Custom fabricate sheet metal flashing and trim to comply with details indicated and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurements for accurate fit before shop fabrication.
4. Form sheet metal flashing and trim to fit substrates without excessive oil-canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of **1/4 inch in 20 ft.** on slope and location lines indicated on Drawings and within **1/8-inch** offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than **1 inch** deep, filled with butyl sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal in accordance with cited sheet metal standard to provide for proper installation of elastomeric sealant.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by cited sheet

metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams:

1. Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.
2. Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

H. Do not use graphite pencils to mark metal surfaces.

2.6 ROOF-DRAINAGE SHEET METAL FABRICATIONS

A. Gutters:

1. Fabricate to cross section required, with riveted and soldered joints, complete with end pieces, outlet tubes, and other special accessories as required.
2. Fabricate in minimum **96-inch-** long sections. Fabricate expansion joints and accessories from same metal as gutters unless otherwise indicated.
3. Fabricate gutters with built-in expansion joints.
4. Fabricate from the following materials:

    a. Stainless Steel: 0.0156 inch thick.

B. Downspouts: Fabricate round downspouts to dimensions indicated on Drawings, complete with mitered elbows. Furnish with metal hangers from same material as downspouts and anchors

    a. Aluminum-Zinc Alloy-Coated Steel: 0.040 inch thick.

C. Roof-Penetration Flashing: Fabricate from the following materials:

1. Galvanized Steel: 0.028 inch thick.

2.7 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum **96-inch-** long, but not exceeding **12 ft.** long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend **6 inches** beyond each side of wall openings; and form with **2-inch-** high, end dams. Fabricate from the following materials:

1. Stainless Steel: 0.0156 inch thick.

B. Opening Flashings in Frame Construction: Fabricate head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings. Form head and sill flashing with **2-inch-** high, end dams. Fabricate from the following materials:

1. Galvanized Steel: 0.022 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over substrate to prevent air infiltration or water penetration.

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

3.2 INSTALLATION OF UNDERLAYMENT

A. Self-Adhering, High-Temperature Sheet Underlayment:

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

3.3 INSTALLATION OF SHEET METAL FLASHING AND TRIM, GENERAL

A. Install sheet metal flashing and trim to comply with details indicated and recommendations of cited sheet metal standard that apply to installation characteristics required unless otherwise indicated on Drawings.

1. Install fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of sealant.
3. Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.
4. Install sheet metal flashing and trim to fit substrates and to result in watertight performance.

5. Install continuous cleats with fasteners spaced not more than **12 inches** o.c.
6. Space individual cleats not more than **12 inches** apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
7. Install exposed sheet metal flashing and trim with limited oil-canning, and free of buckling and tool marks.
8. Do not field cut sheet metal flashing and trim by torch.
9. Do not use graphite pencils to mark metal surfaces.

B. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim.

1. Space movement joints at maximum of 10 ft. with no joints within **24 inches** of corner or intersection.
2. Form expansion joints of intermeshing hooked flanges, not less than **1 inch** deep, filled with sealant concealed within joints.
3. Use lapped expansion joints only where indicated on Drawings.

C. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated.

a. Embed hooked flanges of joint members not less than **1 inch** into sealant.
b. Form joints to completely conceal sealant.
c. When ambient temperature at time of installation is between **40 and 70 deg F**, set joint members for 50 percent movement each way.
d. Adjust setting proportionately for installation at higher ambient temperatures.

1) Do not install sealant-type joints at temperatures below **40 deg F**.

2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter.

1. Pretin edges of sheets with solder to width of **1-1/2 inches**; however, reduce pretinning where pretinned surface would show in completed Work.
2. Do not solder metallic-coated steel sheet.
3. Do not pretin zinc-tin alloy-coated copper.
4. Do not use torches for soldering.
5. Heat surfaces to receive solder, and flow solder into joint.

a. Fill joint completely.
b. Completely remove flux and spatter from exposed surfaces.

3.4 INSTALLATION OF ROOF-DRAINAGE SHEET METAL FABRICATIONS

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

B. Built-in Gutters:

1. Join sections with riveted and soldered joints.
2. Provide for thermal expansion.
3. Slope to downspouts.
4. Provide end closures and seal watertight with sealant.
5. Install underlayment layer in built-in gutter trough and extend to drip edge at eaves and under underlayment on roof sheathing.

    a. Lap sides minimum of **2 inches** over underlying course.
    b. Lap ends minimum of **4 inches**.
    c. Stagger end laps between succeeding courses at least **72 inches**.
    d. Fasten with roofing nails.

6. Anchor and loosely lock back edge of gutter to continuous cleat.
7. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 18 inches apart.

C. Downspouts:

1. Join sections with **1-1/2-inch** telescoping joints.
2. Provide hangers with fasteners designed to hold downspouts securely to walls.
3. Locate hangers at top and bottom and at approximately **60 inches** o.c.
4. Provide elbows at base of downspout to direct water away from building.
5. Connect downspouts to underground drainage system.

3.5 INSTALLATION OF WALL SHEET METAL FABRICATIONS

A. Install sheet metal wall flashing to intercept and exclude penetrating moisture in accordance with cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

B. Opening Flashings in Frame Construction: Install continuous head, sill, jamb, and similar flashings to extend 4 inches beyond wall openings.

C. Reglets: Installation of reglets is specified in Section 042000 "Unit Masonry."

3.6 INSTALLATION TOLERANCES

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

3.7 CLEANING

A. Clean and neutralize flux materials. Clean off excess solder.

B. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain sheet metal flashing and trim in clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures, as determined by Architect.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Roof-edge specialties.
2. Roof-edge drainage systems.
3. Reglets and counterflashings.
4. Underlayment.

B. Related Requirements:

1. Section 042000 "Unit Masonry" for installing embedded reglets and for masonry through-wall flashing with receiver for counterflashing.
2. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
3. Section 077200 "Roof Accessories" for manufactured roof curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
4. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.

1.2 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. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
2. Details of termination points and assemblies, including fixed points.
3. Details of special conditions.

C. Samples: For each type of roof specialty and for each color and texture specified.

D. 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 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.

1.3 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of roof specialty roof-edge flashings that is ANSI/SPRI/FM 4435/ES-1 tested.

B. Product Test Reports: For roof-edge flashings, for tests performed by a qualified testing agency.

C. Research Reports: For roof-edge flashings, from showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Qualification Statements: For manufacturer.

E. Sample warranties.

1.4 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.

1.5 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

1.6 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.

1.7 WARRANTY

A. 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 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. 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 surface.

2.2 ROOF-EDGE DRAINAGE SYSTEMS

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

1. Architectural Products Company
2. Castle Metal Products
3. Hickman; an MTL Company
4. Metal-Era, Inc.
5. RDCA; Roof Drainage Components & Accessories

B. Gutters: Manufactured in uniform section lengths not exceeding 12 ft, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least **1 inch** above front edge. Furnish flat-stock gutter straps, gutter brackets, expansion

joints, and expansion-joint covers fabricated from same metal as gutters.

1. Metallic-Coated Steel Sheet: Nominal 0.028-inch thickness.
2. Gutter Profile: Style A in accordance with SMACNA's "Architectural Sheet Metal Manual."
3. Embossed Surface: Embossed with design selected by Architect from manufacturer's full range.
4. Corners: Factory mitered and continuously welded.
5. Gutter Supports: Manufacturer's standard supports as selected by Architect with finish matching the gutters.
6. Gutter Accessories: Continuous hinged leaf guard of solid metal designed to shed leaves

C. Downspouts: rectangular complete with elbows, manufactured from the following exposed metal. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Metallic-Coated Steel Sheet: Nominal 0.028- thickness.
2. Size: As indicated on Drawings.

D. Finishes:

1. Metallic-Coated Steel: Two-coat fluoropolymer.

    a. Color: As selected by Architect from manufacturer's full range.

2.3 REGLETS AND COUNTERFLASHINGS

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. Berridge Manufacturing Company
2. Castle Metal Products
3. Fry Reglet Corporation
4. Metal-Era, Inc.

B. Reglets: Manufactured units formed to provide secure interlocking of separate reglet and counterflashing pieces, from the following exposed metal:

1. Formed Stainless Steel Sheet: 0.0250 inch thick.
2. Corners: Factory mitered and continuously welded.
3. 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.
4. Masonry Type, Embedded: Provide reglets with offset top flange for embedment in masonry mortar joint.
5. Multiuse Type, Embedded: For multiuse embedment in 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. 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 thickness.

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.

E. Finishes:

1. Metallic-Coated Steel: Two-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

2.4 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

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**.

2.5 UNDERLAYMENT

A. Synthetic Underlayment: Provide laminated or reinforced, woven polyethylene or polypropylene, synthetic roofing underlayment; bitumen free; slip resistant; suitable for high temperatures greater than **220 deg F**; and complying with physical requirements of ASTM D226/D226M for Type I and Type II felts.

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. ATAS International, Inc.
b. Atlas Molded Products, a division of Atlas Roofing Corporation
c. Kirsch Building Products
d. Owens Corning

B. Self-Adhering, High-Temperature Sheet Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum **30 mils** thick, specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer when recommended by underlayment manufacturer.

1. Thermal Stability: Stable after testing at **240 deg F**; ASTM D1970/D1970M.
2. Low-Temperature Flexibility: Passes after testing at **minus 20 deg F** or lower; ASTM D1970/D1970M.

C. Slip Sheet: Rosin-sized building paper, **3-lb/100 sq. ft.** minimum.

2.6 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. 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 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.

2.7 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 OF UNDERLAYMENT

A. Synthetic Underlayment: Install synthetic underlayment, wrinkle free, in accordance with manufacturers' written instructions, and using adhesive where possible to minimize use of mechanical fasteners under sheet metal.

1. Lap horizontal joints not less than **4 inches**.

B. Self-Adhering, High-Temperature Sheet Underlayment:

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

3.3 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. 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. with no joints within 18 inches 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 substrate not less than recommended in writing by fastener manufacturer to achieve maximum pull-out resistance.

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.

3.4 INSTALLATION OF ROOF-EDGE DRAINAGE SYSTEMS

A. Install components to produce a complete roof-edge drainage system in accordance

with manufacturer's written instructions. Coordinate installation of roof perimeter flashing with installation of roof-edge drainage system.

B. Gutters: Join and seal gutter lengths. Allow for thermal expansion. Attach gutters to firmly anchored gutter supports spaced not more than 24 inches apart. Attach ends with rivets and seal with sealant to make watertight. Slope to downspouts.

1. Install gutter with expansion joints at locations indicated but not exceeding 50 ft. apart. Install expansion-joint caps.
2. Install continuous leaf guards on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.

C. Downspouts: Join sections with manufacturer's standard telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls and **1 inch** away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c.

1. Connect downspouts to underground drainage system indicated.

3.5 INSTALLATION OF REGLETS AND COUNTERFLASHINGS

A. Coordinate installation of reglets and counterflashings with installation of base flashings.

B. Embedded Reglets: See 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 077100

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Manufactured units for the following applications:

1. Preformed flashing sleeves.
2. Miscellaneous materials.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for roof cants, nailers, blocking, and other pressure-preservative-treated wood.
2. Section 077100 "Roof Specialties" for manufactured copings, roof-edge specialties, roof-edge drainage systems, reglets, and counterflashing.
3. Section 079200 "Joint Sealants" for field-applied sealants between roof accessories and adjacent materials.

1.2 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.

1.3 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.

1.4 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-accessory substrates by field measurements before fabrication, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 PREFORMED FLASHING SLEEVES

A. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, **provide products by one of 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.**

2. Metal: Aluminum sheet, 0.063 inch thick.
3. Height: 7 inches.
4. Diameter: As indicated on Drawings
5. Finish: Manufacturer's standard.

2.2 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. 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 Extrusions and Tubes: **ASTM B221**, manufacturer's standard alloy and temper for type of use, finished to match assembly where used; otherwise mill finished.

2.3 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 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.

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 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.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

G. Asphalt Roofing Cement: ASTM D4586/D4586M, asbestos free, of consistency required for application.

2.4 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. 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. 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.

B. 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.

C. Seal joints with elastomeric 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 077200

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Mildew-resistant joint sealants.
4. Butyl joint sealants.
5. Latex joint sealants.

1.2 ACTION SUBMITTALS

A. Product Data:

B. Samples for Initial Selection: Manufacturer's standard color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each type and color of joint sealant required, provide Samples with joint sealants in **1/2-inch-** wide joints formed between two **6-inch-** long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.3 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:

1. Joint-sealant location and designation.
2. Manufacturer and product name.
3. Type of substrate material.
4. Proposed test.
5. Number of samples required.

B. Preconstruction Laboratory Test Reports: For each joint sealant and substrate material to be tested from sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation are needed for adhesion.

C. Preconstruction Field-Adhesion-Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

D. Field Quality-Control Reports: For field-adhesion-test reports, for each sealant application tested.

E. Sample warranties.

1.4 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

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

1.5 WARRANTY

A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Silicone, S, NS, 100/50, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

B. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

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

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. Pecora Corporation
c. Sika Corporation - Building Components
d. The Dow Chemical Company

C. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

a. GE Construction Sealants; Momentive Performance Materials Inc.
b. Pecora Corporation
c. Permathane; a Holcim brand
d. Polymeric Systems, Inc.; PPG Industries, Inc.
e. Sherwin-Williams Company (The)
f. Sika Corporation - Building Components
g. The Dow Chemical Company

D. Silicone, Acid Curing, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint

sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

    a. Adfast
    b. Bostik; Arkema
    c. Everkem Diversified Products, Inc.
    d. Pecora Corporation
    e. Polymeric Systems, Inc.; PPG Industries, Inc.
    f. PPG Paints; PPG Industries, Inc.
    g. Premier Building Solutions
    h. Sika Corporation - Building Components
    i. The Dow Chemical Company

E. Silicone, S, NS, 100/50, T, NT: Single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

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

    a. Pecora Corporation
    b. The Dow Chemical Company

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested in accordance with ASTM C1248.

B. Silicone, Nonstaining, S, NS, 100/50, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Use NT.

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

    a. Adfast
    b. Pecora Corporation
    c. Sika Corporation - Building Components
    d. Tremco Incorporated

C. Silicone, Nonstaining, S, NS, 50, NT: Nonstaining, single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 50, Use NT.

1. Manufacturers: Subject to compliance with requirements, available

manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Adfast
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. Pecora Corporation
d. Sika Corporation - Building Components
e. Soudal Accumetric
f. The Dow Chemical Company
g. Tremco Incorporated

D. Silicone, Nonstaining, S, NS, 100/50, T, NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 100/50, Uses T and NT.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. The Dow Chemical Company

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920, Type S, Grade NS, Class 25, Use NT.

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

a. Adfast
b. GE Construction Sealants; Momentive Performance Materials Inc.
c. Pecora Corporation
d. PPG Paints; PPG Industries, Inc.
e. Sika Corporation - Building Components
f. Soudal Accumetric
g. The Dow Chemical Company
h. Tremco Incorporated

2.5 BUTYL JOINT SEALANTS

A. Butyl-Rubber-Based Joint Sealants: ASTM C1311.

1. Manufacturers: Subject to compliance with requirements, provide products by the

following:

a. Bostik; Arkema
b. Pecora Corporation

2.6 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

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. Pecora Corporation
b. Sherwin-Williams Company (The)
c. Tremco Incorporated

2.7 JOINT-SEALANT BACKING

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

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. Construction Foam Products; a division of Nomaco, Inc.
b. Master Builders Solutions, brand of MBCC Group, a Sika company

B. Cylindrical Sealant Backings: ASTM C1330, **Type C (closed-cell material with a surface skin**, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.8 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

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

    a. Concrete.
    b. Masonry.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or

primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application, and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants in accordance with requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile in accordance with Figure 8A in ASTM C1193 unless otherwise indicated.
4. Provide recessed joint configuration of recess depth and at **locations indicated on Drawings** in accordance with Figure 8C in ASTM C1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

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

END OF SECTION 079200

SECTION 081113 - 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.

B. Related Requirements:

1. Section 087100 "Door Hardware" for door hardware for hollow-metal doors.

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.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Interior standard steel doors and frames.
2. Exterior standard steel doors and frames.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, core descriptions, fire-

resistance rating, and finishes.

C. 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.

D. 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. Product Test Reports: For each type of fire-rated hollow-metal door and frame assembly for tests performed by a qualified testing agency indicating compliance with performance requirements.

B. Oversize Construction Certification: For assemblies required to be fire-rated and exceeding limitations of labeled assemblies.

C. Field quality-control reports.

1.7 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 non vented plastic.

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, products by one of the following

1. Ceco Door; AADG, Inc.; ASSA ABLOY
2. Curries, AADG, Inc.; ASSA ABLOY Group
3. Mesker Door; Mesker Openings Group
4. North American Door Corp
5. Republic Doors and Frames; a Allegion brand
6. Steelcraft; Allegion plc

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 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.

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.

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.

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 **0.032 inch**.
d. Edge Construction: Model 2, Seamless.
e. Core: steel stiffener.
f. Fire-Rated Core: Manufacturer's standard vertical steel stiffener, laminated mineral board core for fire-rated doors.

2. Frames:

a. Materials: 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: Full profile welded.

3. Exposed Finish: Prime.

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.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 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. Post installed 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.

2.7 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized in accordance with ASTM A153/A153M.

E. 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.

F. 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.

G. Glazing: Comply with requirements in Section 088000 "Glazing."

2.8 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. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. 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.

3. Terminated Stops (Hospital Stops): Terminate stops 6 inches 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 non templated, 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 mitered hairline joints.

1. Provide stops and moldings flush with face of door, and with beveled 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.

2.9 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 selected by Architect from manufacturer's full range

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 non templated, 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.

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 post installed expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of post installed 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 post installed 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 on parallel lines, and perpendicular to plane of wall.

d. Plumbness: Plus or minus **1/16 inch**, measured at jambs at floor.

C. Hollow-Metal Doors: Fit and adjust hollow-metal doors accurately in frames, within clearances specified below.

1. Non-Fire-Rated Steel Doors: Comply with ANSI/SDI A250.8
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 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 081113

SECTION 081213 - HOLLOW METAL FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior standard steel frames.
2. Exterior standard steel frames.
3. Borrowed lites.

B. Related Requirements:

1. Section 081113 "Hollow Metal Doors and Frames" for hollow-metal doors and frames.

1.2 DEFINITIONS

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

1.5 ACTION SUBMITTALS

A. Product Data:

1. Interior standard steel frames.
2. Exterior standard steel frames.

B. Product Data Submittals: For each product.

1. Include construction details, material descriptions, fire-resistance ratings, and finishes.

C. Shop Drawings: Include the following:

1. Elevations of each frame type.
2. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
3. Locations of reinforcement and preparations for hardware.
4. Details of each different wall opening condition.
5. Details of electrical raceway and preparation for electrified hardware, access control systems, and security systems.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.

D. Product Schedule: For hollow-metal 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 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal frames palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non vented 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 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 FRAMES

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

1. Ceco Door; AADG, Inc.; ASSA ABLOY
2. Curries, AADG, Inc.; ASSA ABLOY Group
3. Mesker Door; Mesker Openings Group
4. North American Door Corp
5. Republic Doors and Frames; a Allegion brand
6. Steelcraft; Allegion plc

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Rated 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 indicated on Drawings, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.
2. Oversize Fire-Rated Frames: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that frames comply with standard construction requirements for tested and labeled fire-rated assemblies except for size.

B. Fire-Rated, Borrowed-Lite 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 according to NFPA 257 or UL 9.

2.3 STANDARD STEEL FRAMES

A. Construct hollow-metal frames to comply with standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Interior Standard Steel Frames: SDI A250.8. At locations indicated in the Door and Frame Schedule on Drawings.

1. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch
2. Construction: Full profile welded.
3. Exposed Finish: Prime.

C. Exterior Standard Steel Frames: SDI A250.8. At locations indicated in the Door and Frame Schedule on Drawings.

1. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A60 coating.
2. Construction: Full profile welded.

2.4 BORROWED LITES

A. Fabricate of metallic-coated steel sheet, minimum thickness of 0.053 inch.

B. Construction: 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 point, 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.

2.5 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. Post installed 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 according to ASTM A153/A153M, Class B.

2.6 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A1008/A1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A1011/A1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A153/A153M.

E. Glazing: Comply with requirements in Section 088000 "Glazing."

2.7 FABRICATION

A. 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: Terminate stops 6 inches above finish floor with a 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.

B. Hardware Preparation: Factory prepare hollow-metal frames to receive templated mortised hardware, and electrical wiring; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule on Drawings, and templates.

1. Reinforce frames to receive non templated, mortised, and surface-mounted door hardware.
2. Comply with BHMA A156.115 for preparing hollow-metal frames for hardware.

C. Glazed Lites: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior frames. Provide loose stops and moldings on inside of hollow-metal frames.
3. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.
4. 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.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's full range

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 frames to receive non templated, mortised, and surface-mounted door hardware.

3.2 INSTALLATION

A. General: Install hollow-metal frames plumb, rigid, properly aligned, and securely fastened in place. Comply with approved Shop Drawings and with manufacturer's written instructions. Comply with SDI A250.11

B. 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.

1. 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.
2. Install frames with removable stops located on secure side of opening.

C. Fire-Rated Openings: Install frames according to NFPA 80.

D. Floor Anchors: Secure with post installed expansion anchors.

1. Floor anchors may be set with power-actuated fasteners instead of post installed expansion anchors if so indicated and approved on Shop Drawings.

E. Solidly pack mineral-fiber insulation inside frames.

F. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or mortar.

G. In-Place Concrete or Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.

H. Installation Tolerances: Adjust hollow-metal frames to the following tolerances:

1. Squareness: Plus or minus **1/16 inch**, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus **1/16 inch**, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus **1/16 inch**, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
4. Plumbness: Plus or minus **1/16 inch**, measured at jambs at floor.

I. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

3.3 CLEANING AND TOUCHUP

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 according to manufacturer's written instructions.

C. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081213

SECTION 081416 - 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.

B. Related Requirements:

1. Section 088000 "Glazing" for glass view panels in flush wood doors.
2. 099300 "Staining and Transparent Finishing" for field finishing doors.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Solid-core five-ply flush wood veneer-faced doors and transom panels for transparent finish.

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.

C. 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 finished and application requirements.
10. Apply AWI Quality Certification Program label to Shop Drawings.

1.4 CLOSEOUT SUBMITTALS

A. Special warranties.

1.5 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 carton..

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 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 percent during remainder of construction period.

1.7 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 Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 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 indicated on Drawings, based on testing at positive pressure in accordance with UL 10C.

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.

2.2 FLUSH WOOD DOORS AND FRAMES, GENERAL

A. Quality Standard: In addition to requirements specified, comply with ANSI/WDMA I.S. 1A.

1. Provide labels, and, certificates from AWI certification program indicating that doors comply with requirements of grades specified.

    a. 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.

2.3 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 one of the following

    a. Lambton Doors
    b. Masonite Architectural
    c. Oshkosh Door Company
    d. VT Industries, Inc.

2. Performance Grade: ANSI/WDMA I.S. 1A Extra Heavy
3. Performance Grade by Location:

a. ANSI/WDMA I.S. 1A Extra Heavy Duty: where indicated on Drawings.
b. ANSI/WDMA I.S. 1A Standard Duty: where indicated on Drawings.

4. ANSI/WDMA I.S. 1A Quality Grade: Premium..
5. Faces: Single-ply wood veneer not less than **1/50 inch** thick.

a. Species: Select white birch
b. Cut: Rotary cut
c. Match between Veneer Leaves: Book match.
d. Assembly of Veneer Leaves on Door Faces: Center-balance 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 or more.
2) Provide door faces of compatible color and grain within each separate room or area of building.

6. Exposed Vertical and Top Edges: Same species as faces or a compatible species - Architectural Woodwork Standards edge Type A

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.

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- in accordance with WDMA T.M. 10.

7. Core for Non-Fire-Rated Doors:

a. ANSI A208.1, Grade LD-1 particleboard.

1) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware:

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.

b. Glued wood stave.
c. WDMA I.S. 10 structural composite lumber.

1) Screw Withdrawal, Door Face: 550 lbf.
2) Screw Withdrawal, Vertical Door Edge: 550 lbf.

d. Either glued wood stave or WDMA I.S. 10 structural composite lumber.

8. 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.

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) 5-inch midrail blocking, in doors indicated to have exit devices.

9. Construction: Five plies, hot-pressed bonded (vertical and horizontal edging is bonded to core), with entire unit abrasive planed before veneering.

2.4 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. 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.

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".

B. Install doors 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 ADJUSTING

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

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

END OF SECTION 081416

SECTION 083323 - OVERHEAD SECTIONAL DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Insulated service doors.

1.2 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead sectional 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 opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

C. Selection Samples: For each finish specified, two complete sets of color chips representing manufacturer’s full range of available colors and patterns.

D. Verification Samples: For each finish specified, two samples, minimum size 6 inches (150mm) square, representing actual product, color, and patterns.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing the types of products specified in this section, with minimum of five years of documented experience, and approved by the door manufacturer.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of doors specified in this section, with nit less than ten years of documents experience.

1.4 WARRANTY

A. Finish Warranty: Provide manufacturer’s standard finish warranty against rust through.

1. Warranty period: 10 years

B. Delamination Warranty: provide manufacturer's standard warranty against delamination.

1. Warranty Period: 10 years

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Clopay Building Products Company, which is located at: 8585 Duke BLVD. ASD; Mason, OH 45040-3101; Toll Free Tel. 800-526-4301 prompt #3; Fax: 88 8-434-3193; Email: CIA@clopay.com Web: www.clopaycommercial.com

B. Substitutions: Not permitted.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 FLUSH STEEL DOORS, THERMALLY-BROKEN, POLSTYRENE INSULATED

A. Door Construction:

a. Panels: Sandwiched construction of exterior and interior steel skin pressure bonded to an expanded core, with skins separated by a continuous silicone filling forming a thermal break.
b. Steel skins: Formed from roll formed commercial or drawing quality steel sheet, hot-dip galvanized per ASTM A 924/A 924M and ASTM A 653/A 653M, pre-painted with primer and baked-on polyester topcoat; sections formed to create weather tight tounge-in0groove meeting joint, unless otherwise specified.
c. Reinforcing: Galvanized and primed steel reinforcement located under each hinge location, pre-punched for hinge attachment.
d. Handle: High impact polymer step plate/lift handle on bottom panel section.

B. PREMIUM DUTY DOOR: CLOPAY MODEL 3220.

1. Maximum Door Size: 28ft, 2 inches (8.6m) wide by 26 ft (7.9m) high.
2. Overall Panel Thickness: 2 inches (51mm).
3. Steel Skin Thickness: Minimum 20 gauge 0.034 inch (0.86 mm) exterior, minimum 28 gauge 0.015 inch (0.38mm) Interior.
4. Stiles: Steel prepainted end stiles, minimum 0.049 inch (1.25mm) thick, engineered for easy hardware attachment through pre-punched holes.
5. Bottom panel section reinforced with continuous 0.050 inch(1.27mm) aluminum astragal retainer with U-shaped flexible PVC astragal.
6. Thermal Resistance (R-value): 9.1 deg F hr sq/ft/Btu (1.6 (K sq m)/W); calculated

door section R-value in accordance with DASMA TDS-163.

7. Windows: Extruded polypropylene windows measuring 12 inches by 24 inches (200 mm by 600 mm).

    a. Glazing: 1 inch nominal (25mm) insulated glass.

8. Finish: Stucco embossed texture, white interior, exterior as follows:

    a. White

9. Locking: Inside spring loaded slide bolt lock on end stile that engages slot in track.

    a. Provide one inside slide lock.

10. Weather stripping: Provide complete perimeter seals. Provide flexible top seal, flexible jamb seal and U shaped bottom seal.
11. Tracks: Vertical tracks minimum 0.061 inch (1.55 mm) galvanized steel tapered and mounted for wedge type closing. Horizontal tracks minimum 0.075 inch (1.91 mm) galvanized steel, reinforced with minimum 0.0897 inch (2.28m) galvanized steel angles as required.

    a. Track Width: 3 inches (75mm)
    b. Provide standard lift tracks with 15 inches (381 mm) radius track as indicated.
    c. Provide vertical lift tracks as indicated.
    d. Provide high lift tracks as indicated.

12. Spring Counterbalance: Torsion spring counterbalance mechanism sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft, cable drum of die cast aluminum with high strength galvanized cable with minimum 7 to 1 safety factor.

    a. High Cycle Spring: 50,000 cycles.

2.3 ELECTRIC DOOR OPERATORS

A. General: Provide electric door operator provided by door manufacturer for door with operational life specified complete with electric motor and factory pre-wired motor controls, starter, gear-reduction unit, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation. Comply with NFPA 70.

    1. Solenoid-operated brake.

B. Disconnect device: Provide hand-operated disconnect or mechanism for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

C. Design operator so motor can may be removed without disturbing limit switch adjustment and without affecting emergency auxiliary operator.

D. Provide control equipment complying with NEMA ICS1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-v, AC or DC.

E. Electric Motors: Provide high-starting torque, reversable, continuous-duty, Class A insulated, electric motor, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1fps (.03m/s), without exceeding nameplate ratings or considering service factor.

1. Type: Mechanical.
2. Type: Solid State.
3. Type: Jackshaft.
4. Type: Trolley.
5. HP:

    a. 1 hp (746 W)

6. Power Characteristics:

    a. 220v
    b. 3 phase.

7. Service Factor:

    a. NEMA MG 1

8. Coordinate wiring requirements and electrical characteristics of motors with building electrical system.

F. Remote Control Station: Provide momentary contact, 3-button control station with push – button controls labeled “Open”, Close”, and “Stop”

G. Provide interior units, fully guarded, surface mounted, heavy-duty type, with general purpose NEMA ICS6 enclosure in one of the following types:

1. Enclosure Type: Type 1

H. Obstruction Detection Device: provide each motorized door with indicated external automatic safety sensor able to protect full width of door opening. Activation of sensor immediately stops and reverses downward travel.

1. Sensor Edge: provide each motorized door with a n automatic safety sensing edge, located within astragal or weather stripping mounted to bottom bar. Contact with sensor immediately stops and reverses downward door travel. Connect to control circuit using manufacturer’s standard take-up reel or self-coiling cord. Sensing edge shall be operated by:

    a. Electric Fail safe.

2. Photo-electric control: Provide each motorized door with a phot-electric device that will stop and reverse the downward travel if the light beam is broken or blocked. Device shall be:

    a. NEMA Type 1.

3. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.
4. Radio Controls: provide 3 button radio transmitter to provide remote open, close, stop functionality.

    a. Provide external antenna and coaxial wiring to receiver to enhance radio control reception.

5. Provide auxiliary chain hoist: for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so that are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine wall and overhead areas, including framing and blocking, with installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work in the section.

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

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. 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 overhead doors and track in accordance with approved shop drawings and the manufacturer’s printed instructions.

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 083323

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Kawneer Aluminum Windows including perimeter trims, stools, accessories, shims and anchors, and perimeter sealing of window units.

1. Types of Aluminum windows include.

a. Kawneer Series 8225TL Thermal Windows.
b. Fixed with blinds and Project-Out with blinds.
c. 2-1/4" (57.2mm) frame depth, with 0.125" (3.2mm) wall thickness.
d. AW-PG90-AP

1.2 DEFINITIONS

A. For fenestration industry standard terminology and definitions refer to American Architectural manufacturers Association (AAMA) - AAMA Glossary (AMMA AG).

1.3 COORDINATION

A. Finish Matching: Coordinate all exposed exterior aluminum components and trim to ensure uniform and consistent color and appearance. Use products specified in **this Section** as a benchmark. Architect's decision will be final as to whether a proposed product matches.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review and discuss finishing of aluminum windows that is required to be coordinated with finishing of other aluminum work for color and finish matching.
3. Review, discuss, and coordinate interrelationship of aluminum windows with other exterior wall components. Include provisions for anchoring, flashing, weeping, sealing perimeters, and protecting finishes.
4. Review and discuss sequence of work required to construct a watertight and weathertight exterior building envelope.
5. Inspect and discuss condition of substrate and other preparatory work performed by other trades.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes.

B. Shop Drawings:

1. Plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

C. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

D. Samples for Verification: Actual sample of finished products for each type of exposed finish:

1. Exposed Aluminum Finishes: Manufacturers' standard size.
2. Exposed Hardware: Full-size units.

E. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For manufacturer and Installer.

B. Sample warranties.

1.7 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Manufacturers' special warranties.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver aluminum windows to Project site in original, unopened packages and store them in accordance with manufacturer's written instructions. Protect aluminum windows against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Handle aluminum windows in a manner that prevents damage before, during, and after installation.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not install aluminum windows outside of limits recommended in writing by manufacturer.

1.10 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures, including excessive deflection, water leakage, condensation, and air infiltration.
c. Faulty operation of movable sash and hardware.
d. Deterioration of materials and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Two years from date of Substantial Completion.
b. Glazing Units: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain aluminum windows from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Window Certification: FGIA certified with label attached to each window.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: and Grade AW -PG100-FW and AW-PG90-AP.

C. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Thermal Transmittance (U-factor): As determined in accordance with NFRC 100:

a. Fixed Windows: Not more than.34 Btu/sq. ft. x h x deg F.

b. Operable Windows: Not more than 0.54 Btu/sq. ft. x h x deg F.

2. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance in accordance with AAMA 1503, showing a CRF of 57 for Fixed windows and 55 for Project-Out.

D. Thermal Movements: Provide aluminum windows, including anchorage, which allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F ambient; 180 deg F material surface.

E. Windborne-Debris Impact Resistance: Passes ASTM E1886 missile-impact and cyclic-pressure tests in accordance with ASTM E1996 for Wind Zone 1 for basic protection.

1. Large-Missile Test: For glazing located within 30 ft. of grade.
2. Small-Missile Test: For glazing located more than 30 ft. above grade.

2.3 ALUMINUM WINDOWS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer Model 8225TL - Fixed and Out-Swing with Blinds or comparable product by one of the following:

1. EFCO Corporation
2. Kawneer Company, Inc.; Arconic Corporation
3. OldCastle BuildingEnvelope (OBE)
4. Winco Window Company, Inc.

B. Provide manufacturer's standard aluminum window assemblies consisting of frames, sashes, glass, hardware, fasteners, and all components and accessories as required for a complete installation.

C. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Casement: Outswing..
2. Fixed.

D. Frames and Sashes: Aluminum extrusions of alloy, temper, and strength complying with AAMA/WDMA/CSA 101/I.S.2/A440.

1. Thermally Broken Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.

E. Glass: Clear annealed glass, ASTM C1036, Type 1, Class 1, q3.

1. Kind: Fully tempered where indicated on Drawings.

F. Insulating-Glass Units: ASTM E2190.

1. Glass: ASTM C1036, Type 1, Class 1, q3.

a. Tint: Clear.
b. Kind: Fully tempered where indicated on Drawings.

2. Lites: Two.
3. Filling: Fill space between glass lites with air.
4. Low-E Coating: Pyrolytic on second surface.
5. Integral Louver Blinds: Provide glass manufacturer's standard, horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of sash.

a. Operation: Tilt only.
b. Color: White.

G. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

H. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

I. Window Hardware: Casement and projected.

1. Gear-Type Rotary Operators: Complying with AAMA 901 when tested in accordance with ASTM E405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.

a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.

2. Hinges: Non-friction type, not less than two per sash.
3. Lock: Lever handle and cam-action lock with keeper.
4. Limit Devices: Concealed support arms with adjustable, limited, hold-open limit devices designed to restrict sash opening.

a. Limit clear opening to 4 inches for ventilation; with custodial key release.

5. Pole Operators: Tubular-shaped anodized aluminum; with rubber-capped lower end and standard push-pull hook at top to match hardware design; of sufficient

length to operate window without reaching more than **60 inches** above floor; one pole operator and pole hanger per room that has operable windows more than **72 inches** above floor.

J. Weather Stripping: Provide manufacturer's standard full-perimeter weather stripping for each operable sash unless otherwise indicated.

K. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Avoid exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

L. Mullions: Provide manufacturer's standard combination and reinforcing mullions and cover plates matching window units, complete with anchors for support to structure. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide reinforcing mullions and cover plates capable of withstanding design wind loads of window units.

2.4 ACCESSORIES

A. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.

B. Interior Trim: Extruded-aluminum profiles in sizes and configurations indicated on Drawings.

C. Panning Trim: Profiles in sizes and configurations indicated on Drawings.

D. Nail Fins: Manufacturer's standard mounting flanges with holes pre-punched for mechanical fasteners.

2.5 FABRICATION

A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.

B. Glaze aluminum windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for

shipment and installation.

2.6 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 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.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders,air and weather barriers, and other built-in components to ensure weathertight window installation.

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

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E2112.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

C. Mullions: Install combination and reinforcing mullions for combination assemblies in accordance with manufacturer's written instructions.

D. Install windows and components to drain water passing joints and condensation to the exterior.

E. Separate aluminum from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 ADJUSTING

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

3.4 CLEANING AND PROTECTION

A. Clean exposed surfaces immediately after installing windows using manufacturer's written instructions. Avoid damaging finishes. Remove excess sealants, glazing materials, dirt, and other substances.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately in accordance with manufacturer's written instructions.

END OF SECTION 085113

SECTION 087100 – DOOR HARDWARE GENERAL

PART 1 -

a. SUMMARY

i. Section includes:

1.1 Mechanical and electrified door hardware
1.2 Electronic access control system components

ii. Section excludes:

1.1 Windows
1.2 Cabinets (casework), including locks in cabinets
1.3 Signage
1.4 Toilet accessories
1.5 Overhead doors

iii. Related Sections:

1.1 Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
1.2 Division 06 Section "Rough Carpentry"
1.3 Division 06 Section "Finish Carpentry"
1.4 Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
1.5 Division 08 Sections:
A. "Metal Doors and Frames"
B. "Flush Wood Doors"
C. "Stile and Rail Wood Doors"
D. "Interior Aluminum Doors and Frames"
E. "Aluminum-Framed Entrances and Storefronts"
F. "Stainless Steel Doors and Frames"
G. "Special Function Doors"
H. "Entrances"

1.6 Division 26 "Electrical" sections for connections to electrical power system and for low-voltage wiring.
1.7 Division 28 "Electronic Safety and Security" sections for coordination with other components of electronic access control system and fire alarm system.

b. REFERENCES

i. UL LLC

1.1 UL 10B - Fire Test of Door Assemblies

1.2 UL 10C - Positive Pressure Test of Fire Door Assemblies
1.3 UL 1784 - Air Leakage Tests of Door Assemblies
1.4 UL 305 - Panic Hardware

ii. DHI - Door and Hardware Institute

1.1 Sequence and Format for the Hardware Schedule
1.2 Recommended Locations for Builders Hardware
1.3 Keying Systems and Nomenclature
1.4 Installation Guide for Doors and Hardware

iii. NFPA – National Fire Protection Association

1.1 NFPA 70 – National Electric Code
1.2 NFPA 80 – 2016 Edition – Standard for Fire Doors and Other Opening Protectives
1.3 NFPA 101 – Life Safety Code
1.4 NFPA 105 – Smoke and Draft Control Door Assemblies
1.5 NFPA 252 – Fire Tests of Door Assemblies

iv. ANSI - American National Standards Institute

1.1 ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
1.2 ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
1.3 ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
1.4 ANSI/WDMA I.S. 1A - Interior Architectural Wood Flush Doors
1.5 ANSI/SDI A250.8 - Standard Steel Doors and Frames

c. SUBMITTALS

i. General:

1.1 Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
1.2 Prior to forwarding submittal:
A. Review drawings and Sections from related trades to verify compatibility with specified hardware.
B. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

ii. Action Submittals:

1.1 Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
1.2 Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
A. Wiring Diagrams: For power, signal, and control wiring and including:

1. Details of interface of electrified door hardware and building safety and security systems.
2. Schematic diagram of systems that interface with electrified door hardware.
3. Point-to-point wiring.
4. Risers.

1.3 Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   A. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

1.4 Door Hardware Schedule:
   A. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   B. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   C. Indicate complete designations of each item required for each opening, include:
      1. Door Index: door number, heading number, and Architect's hardware set number.
      2. Quantity, type, style, function, size, and finish of each hardware item.
      3. Name and manufacturer of each item.
      4. Fastenings and other pertinent information.
      5. Location of each hardware set cross-referenced to indications on Drawings.
      6. Explanation of all abbreviations, symbols, and codes contained in schedule.
      7. Mounting locations for hardware.
      8. Door and frame sizes and materials.
      9. Degree of door swing and handing.
      10. Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

1.5 Key Schedule:
   A. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   B. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   C. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.

D. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
E. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
F. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

iii. Informational Submittals:

1.1 Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
1.2 Provide Product Data:
A. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
B. Include warranties for specified door hardware.

iv. Closeout Submittals:

1.1 Operations and Maintenance Data: Provide in accordance with Division 01 and include:
A. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
B. Catalog pages for each product.
C. Final approved hardware schedule edited to reflect conditions as installed.
D. Final keying schedule
E. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
F. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

v. Inspection and Testing:

1.1 Submit written reports to the Owner and Authority Having Jurisdiction (AHJ) of the results of functional testing and inspection for:
A. Fire door assemblies, in compliance with NFPA 80.
B. Required egress door assemblies, in compliance with NFPA 101.

d. QUALITY ASSURANCE

i. Qualifications and Responsibilities:

1.1 Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project’s vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.

1.2 Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.

1.3 Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:

A. For door hardware: DHI certified AHC or DHC.
B. Can provide installation and technical data to Architect and other related subcontractors.
C. Can inspect and verify components are in working order upon completion of installation.
D. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

1.4 Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

ii. Certifications:

1.1 Fire-Rated Door Openings:

A. Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction.
B. Provide only items of door hardware that are listed products tested by UL LLC, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

1.2 Smoke and Draft Control Door Assemblies:

A. Provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105
B. Comply with the maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at tested pressure differential of 0.3-inch wg (75 Pa) of water.

1.3 Electrified Door Hardware

A. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

1.4 Accessibility Requirements:

A. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

iii. Pre-Installation Meetings

1.1 Keying Conference

A. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:

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

1.2 Pre-installation Conference

A. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
B. Inspect and discuss preparatory work performed by other trades.
C. Inspect and discuss electrical roughing-in for electrified door hardware.
D. Review sequence of operation for each type of electrified door hardware.
E. Review required testing, inspecting, and certifying procedures.
F. Review questions or concerns related to proper installation and adjustment of door hardware.

1.3 Electrified Hardware Coordination Conference:

A. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

e. DELIVERY, STORAGE, AND HANDLING

i. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

ii. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer's original packaging.

iii. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

iv. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

v. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

vi. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

f. COORDINATION

i. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.

ii. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

iii. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

iv. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

g. WARRANTY

i. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

1.1 Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.
1.2 Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.
A. Mechanical Warranty
1. Locks
a. Schlage ND Series: 10 years
2. Exit Devices
a. Von Duprin: 10 years
3. Closers
a. LCN 4050 Series: 25 years
B. Electrical Warranty
1. Exit Devices
a. Von Duprin: 3 years

h. MAINTENANCE

i. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

ii. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

a. MANUFACTURERS

i. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."

2.1 Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.

ii. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance with section 01 25 00.

iii. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

iv. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

b. MATERIALS

i. Fabrication

2.1 Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer’s recognized installation standards for application intended.
2.2 Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
2.3 Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with “Metal Doors and Frames”, “Flush Wood Doors”, “Stile and Rail Wood Doors” to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

ii. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

2.1 Where fasteners are exposed to view: Finish to match adjacent door hardware material.

iii. Cable and Connectors:

2.1 Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2.2 Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.

2.3 Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

c. HINGES

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Ives 5BB series

ii. Requirements:

2.1 Provide hinges conforming to ANSI/BHMA A156.1.
2.2 Provide five knuckle, ball bearing hinges.
2.3 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
A. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
B. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high

2.4 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
A. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
B. Interior: Heavy weight, steel, 5 inches (127 mm) high

2.5 Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
2.6 Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
2.7 Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
A. Steel Hinges: Steel pins
B. Non-Ferrous Hinges: Stainless steel pins
C. Out-Swinging Exterior Doors: Non-removable pins
D. Out-Swinging Interior Lockable Doors: Non-removable pins
E. Interior Non-lockable Doors: Non-rising pins

2.8 Provide hinges with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware. Locate electric hinge at second hinge from bottom or nearest to electrified locking component. Provide mortar guard for each electrified hinge specified.

d. ELECTRIC POWER TRANSFER

i. Manufacturers:

2.1 Scheduled Manufacturer and Product:
A. Von Duprin EPT-10

ii. Requirements:

2.1 Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2.2 Locate electric power transfer per manufacturer's template and UL requirements, unless interference with operation of door or other hardware items.

e. CYLINDRICAL LOCKS – GRADE 1

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Schlage ND series

ii. Requirements:

2.1 Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3-hour fire doors.
2.2 Indicators: Where specified, provide escutcheon with lock status indicator window on top of lockset rose:
A. Escutcheon height (including rose) 6.05 inches high by 3.68 inches wide.
B. Indicator window measuring a minimum 3.52-inch by .60 inch with 1.92 square-inches of front facing viewing area and 180-degree visibility with a total of .236 square-inches of total viewable area.
C. Provide snap-in serviceable window to prevent tampering. Lock must function if indicator is compromised.
D. Provide messages color-coded with full text and symbol, as scheduled, for easy visibility.
E. Unlocked and Unoccupied message will display on white background, and Locked and Occupied message will display on red background.

2.3 Cylinders: Refer to "KEYING" article, herein.
2.4 Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2-inch latch throw. Provide proper latch throw for UL listing at pairs.
2.5 Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
2.6 Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
2.7 Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
2.8 Provide electrified options as scheduled in the hardware sets.
2.9 Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
A. Lever Design: RHO

f. EXIT DEVICES

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Von Duprin 78/75A series

ii. Requirements

2.1 Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware with manufacturer's approved strikes.
2.2 Cylinders: Refer to "KEYING" article, herein.
2.3 Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements. No plastic inserts are allowed in touchpads.
2.4 Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect. Touchpad must extend a minimum of one half of door width.
2.5 Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
2.6 Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
2.7 Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
2.8 Provide electrified options as scheduled.
2.9 Top latch mounting: double- or single-tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
2.10 Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

g. ACCESS CONTROL READER

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Schlage MT Series

ii. Requirements:

2.1 Provide access control card readers manufactured by a global company who is a recognized leader in the production of access control devices. Card reader manufactured for non-access control applications are not acceptable
2.2 Provide multi-technology contactless readers complying with ISO 14443.
2.3 Provide access control card readers capable of reading the following technologies:
A. CSN - DESFire® CSN, HID iCLASS® CSN, Inside Contactless PicoTag® CSN, ST Microelectronics® CSN, Texas Instruments Tag-It®, CSN, Phillips I-Code® CSN
B. 125 KHz proximity - Schlage® Proximity, HID® Proximity, GE/CASI® Proximity, AWID® Proximity, LenelProx®
C. 13.56 MHz Smart card - Schlage smart cards using MIFARE Classic® EV1, Schlage smart cards using MIFARE Plus®, Schlage smart cards using MIFARE® DESFire® EV1, Schlage smart cards using MIFARE® DESFire® EV2/EV3

h. ACCESS CONTROL READER

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Schlage MTB Series

ii. Requirements:

2.1 Provide access control card readers manufactured by a global company who is a recognized leader in the production of access control devices. Card reader manufactured for non-access control applications are not acceptable.
2.2 Provide multi-technology contactless readers complying with ISO 14443.
2.3 Provide access control card readers capable of reading the following technologies:
A. CSN - DESFire® CSN, HID iCLASS® CSN, Inside Contactless PicoTag® CSN, ST Microelectronics® CSN, Texas Instruments Tag-It®, CSN, Phillips I-Code® CSN
B. 125 KHz proximity - Schlage® Proximity, HID® Proximity, GE/CASI® Proximity, AWID® Proximity, LenelProx®
C. 13.56 MHz Smart card - Schlage smart cards using MIFARE Classic® EV1/EV3, Schlage smart cards using MIFARE Plus®, Schlage smart cards using MIFARE® DESFire® EV1/EV3, Schlage smart cards using MIFARE® DESFire® EV2/EV3
D. 13.56 MHz NFC (mobile), 2.45 GHz Bluetooth (mobile) - Mobile means compatible with Bluetooth and NFC-enabled smartphones.

i. POWER SUPPLIES

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. Schlage/Von Duprin PS900 Series

ii. Requirements:

2.1 Provide power supplies approved by manufacturer of supplied electrified hardware.
2.2 Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
2.3 Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
2.4 Provide power supplies with the following features:
A. 12/24 VDC Output, field selectable.
B. Class 2 Rated power limited output.
C. Universal 120-240 VAC input.
D. Low voltage DC, regulated and filtered.
E. Polarized connector for distribution boards.
F. Fused primary input.

G. AC input and DC output monitoring circuit w/LED indicators.
H. Cover mounted AC Input indication.
I. Tested and certified to meet UL294.
J. NEMA 1 enclosure.
K. Hinged cover w/lock down screws.
L. High voltage protective cover.

j. CYLINDERS

i. Manufacturers:

2.1 Scheduled Manufacturer and Product:
A. BEST SFIC

2.2 Acceptable Manufacturers and Products:
A. No Substitute

ii. Requirements:

2.1 Provide cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

k. KEYING

i. Scheduled System:

2.1 Existing factory registered system:
A. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

ii. Requirements:

2.1 Construction Keying:
A. Replaceable Construction Cores.
1. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
a. 3 construction control keys
b. 12 construction change (day) keys.
2. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.2 Permanent Keying:
A. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
1. Master Keying system as directed by the Owner.
B. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.

C. Provide keys with the following features:
   1. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
   2. Patent Protection: Keys and blanks protected by one or more utility patent(s).
   3. Geographically Exclusive: Where High Security or Security cylinders/cores are indicated, provide nationwide, geographically exclusive key system complying with the following restrictions.

D. Identification:
   1. Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
   2. Identification stamping provisions must be approved by the Architect and Owner.
   3. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
   4. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
   5. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

E. Quantity: Furnish in the following quantities.
   1. Permanent Control Keys: 3.
   2. Master Keys: 6.
   3. Change (Day) Keys: 3 per cylinder/core that is keyed differently
   4. Key Blanks: Quantity as determined in the keying meeting.

l. KEY CONTROL SYSTEM

i. Manufacturers:

2.1 Scheduled Manufacturer:
   A. Telkee

2.2 Acceptable Manufacturers:
   A. No Substitute
   B. HPC
   C. Lund

ii. Requirements:

2.1 Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
   A. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
   B. Provide hinged-panel type cabinet for wall mounting.

m. DOOR CLOSERS

i. Manufacturers and Products:

2.1 Scheduled Manufacturer and Product:
A. LCN 4050A series

ii. Requirements:

2.1 Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2.2 Provide door closers with fully hydraulic, full rack and pinion action with cast aluminum cylinder.
2.3 Closer Body: 1-1/2-inch (38 mm) diameter with 11/16-inch (17 mm) diameter heat-treated pinion journal and full complement bearings.
2.4 Hydraulic Fluid: Fireproof, passing requirements of UL10C, and all weather requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
2.5 Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
2.6 Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and back check.
2.7 Pressure Relief Valve (PRV) Technology: Not permitted.
2.8 Provide stick on templates, special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

n. PROTECTION PLATES

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Ives

ii. Requirements:

2.1 Provide protection plates with a minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
2.2 Sizes plates 2 inches (51 mm) less width of door on single doors, pairs of doors with a mullion, and doors with edge guards. Size plates 1 inch (25 mm) less width of door on pairs without a mullion or edge guards.
2.3 At fire rated doors, provide protection plates over 16 inches high with UL label.

o. OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

i. Manufacturers:

2.1 Scheduled Manufacturers:
A. Glynn-Johnson

ii. Requirements:

2.1 Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.

p. DOOR STOPS AND HOLDERS

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Ives

ii. Provide door stops at each door leaf:

2.1 Provide wall stops wherever possible. Provide concave type where lockset has a push button of thumbturn.
2.2 Where a wall stop cannot be used, provide universal floor stops.
2.3 Where wall or floor stop cannot be used, provide overhead stop.
2.4 Provide roller bumper where doors open into each other and overhead stop cannot be used.

q. THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Zero International

ii. Requirements:

2.1 Provide thresholds, weather-stripping, and gasketing systems as specified and per architectural details. Match finish of other items.
2.2 Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
2.3 Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
2.4 Size thresholds 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width unless otherwise specified in the hardware sets or detailed in the drawings.

r. SILENCERS

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Ives

ii. Requirements:

2.1 Provide "push-in" type silencers for hollow metal or wood frames.
2.2 Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
2.3 Omit where gasketing is specified.

s. DOOR POSITION SWITCHES

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Schlage

ii. Requirements:

2.1 Provide recessed or surface mounted type door position switches as specified.
2.2 Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

t. COAT HOOKS

i. Manufacturers:

2.1 Scheduled Manufacturer:
A. Ives

ii. Provide coat hooks as specified.

u. FINISHES

i. FINISH: BHMA 626/652 (US26D); EXCEPT:

2.1 Hinges at Exterior Doors: BHMA 630 (US32D)
2.2 Aluminum Geared Continuous Hinges: BHMA 628 (US28)
2.3 Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
2.4 Protection Plates: BHMA 630 (US32D)
2.5 Overhead Stops and Holders: BHMA 630 (US32D)
2.6 Door Closers: Powder Coat to Match
2.7 Wall Stops: BHMA 630 (US32D)
2.8 Latch Protectors: BHMA 630 (US32D)
2.9 Weatherstripping: Clear Anodized Aluminum
2.10 Thresholds: Mill Finish Aluminum

ii. FINISH: BHMA 630 (US32D); EXCEPT:

2.1 Aluminum Geared Continuous Hinges: BHMA 628 (US28)
2.2 Door Closers: Powder Coat to Match
2.3 Weatherstripping: Clear Anodized Aluminum
2.4 Thresholds: Mill Finish Aluminum

PART 3 - EXECUTION

a. EXAMINATION

i. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

ii. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

iii. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

b. INSTALLATION

i. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

3.1 Standard Steel Doors and Frames: ANSI/SDI A250.8.
3.2 Custom Steel Doors and Frames: HMMA 831.
3.3 Interior Architectural Wood Flush Doors: ANSI/WDMA I.S. 1A
3.4 Installation Guide for Doors and Hardware: DHI TDH-007-20

ii. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

iii. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

iv. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

v. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

vi. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

vii. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

viii. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

ix. Lock Cylinders:

3.1 Install construction cores to secure building and areas during construction period.
3.2 Replace construction cores with permanent cores as indicated in keying section.
3.3 Furnish permanent cores to Owner for installation.

x. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

3.1 Conduit, junction boxes and wire pulls.
3.2 Connections to and from power supplies to electrified hardware.
3.3 Connections to fire/smoke alarm system and smoke evacuation system.
3.4 Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
3.5 Connections to panel interface modules, controllers, and gateways.
3.6 Testing and labeling wires with Architect's opening number.

xi. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

xii. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

xiii. Door Closers & Auto Operators: Mount closers/operators on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers/operators so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

xiv. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

xv. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

xvi. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

xvii. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.

xviii. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

xix. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

c. ADJUSTING

i. 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.

3.1 Spring Hinges: Adjust to achieve positive latching when door can close freely from an open position of 30 degrees.
3.2 Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
3.3 Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

ii. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

d. CLEANING AND PROTECTION

i. Clean adjacent surfaces soiled by door hardware installation.

ii. Clean operating items per manufacturer's instructions to restore proper function and finish.

iii. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

e. DOOR HARDWARE SCHEDULE

i. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

ii. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

iii. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

iv. Hardware Sets:

124981 OPT0403976 Version 2

Legend:
Link to catalog cut sheet
Electrified Opening

Hardware Group No. 04 - SHOWERS

For use on Door #(s):
103 110 111

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		630	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC		626	SCH
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	COAT AND HAT HOOK	571		626	IVE

Hardware Group No. 05 - OFFICE

For use on Door #(s):
102

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 06 - DORMS

For use on Door #(s):
104 105 106 107

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER
1	EA	COAT AND HAT HOOK	571		626	IVE

Hardware Group No. 07 - STORAGE

For use on Door #(s):
108 ALT-1 109 ALT-1 120

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 08 - MECH.

For use on Door #(s):
115

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	STOREROOM LOCK	ND80HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 09 - CORR. TO BAY

For use on Door #(s):
100B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 09.1 - CORR. TO BAY

For use on Door #(s):
125

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER
1	EA	DOOR SWEEP	39A (SIZE AS REQ'D)		A	ZER

Hardware Group No. 10 - CLOSET

For use on Door #(s):
113

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 11 - LAUNDRY

For use on Door #(s):
112

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 12 - WELLNESS

For use on Door #(s):
123

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL/FLOOR STOP AS NEEDED	WS406/FS13		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 13 - GEAR RM

For use on Door #(s):
100D

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. 14 - GEAR RM

For use on Door #(s):
116

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	OH STOP	90S		630	GLY
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS REG ARM MOUNT ON PULL SIDE		630	IVE
1	EA	WALL/FLOOR STOP AS NEEDED	WS406/FS13		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER
1	EA	DOOR SWEEP	39A (SIZE AS REQ'D)		A	ZER

Hardware Group No. 15 - CORR.

For use on Door #(s):
100E 114

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 16 - DECON

For use on Door #(s):
100C

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL/FLOOR STOP AS NEEDED	WS406/FS13		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER
1	EA	DOOR SWEEP	39A (SIZE AS REQ'D)		A	ZER

Hardware Group No. 17 - CORR. RATED

For use on Door #(s):
114B

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	FIRE EXIT HARDWARE	78-L-F-06-SNB		630	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A EDA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. 18 - CASCADE

For use on Door #(s):
124 ALT

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	CLASSROOM LOCK	ND70HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

CONFIRM FUNCTION OF ROOM/LOCK

Hardware Group No. ALT-2 DORMS - ALT-2 DORMS

For use on Door #(s):
108 ALT-2 109 ALT-2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PRIVACY LOCK W/ OUTSIDE INDICATOR	ND40S RHO OS-OCC		626	SCH
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	WALL STOP	WS406/407CVX		630	IVE
1	EA	GASKETING	488SBK PSA (SIZE AS REQ'D)		BK	ZER

Hardware Group No. ALT-3 DORM - ALT-3 DORM

For use on Door #(s):
108X ALT-3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	PASSAGE SET	ND10S RHO		626	SCH
1	EA	FLOOR STOP	FS13		626	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. ALT-3 OFFICE - ALT-3 OFFICE

For use on Door #(s):
109 ALT-3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5		652	IVE
1	EA	ENTRANCE/OFFICE LOCK	ND50HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	WALL STOP	WS406/407CVX		630	IVE
3	EA	SILENCER	SR64		GRY	IVE

Hardware Group No. EXT-01 - EXT. DOORS

For use on Door #(s):
100A 100K 101 114A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10	✓	689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-78-NL-SNB 24 VDC	✓	630	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)		AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)		AA	ZER
1	EA	DOOR SWEEP	8197AA (SIZE AS REQ'D)		AA	ZER
1	EA	THRESHOLD	65A-224 (SIZE AS REQ'D)		A	ZER
1	EA	CREDENTIAL READER	MTB11/15 5VDC - 28VDC (PROVIDED BY SECURITY CONTRACTOR)	✓	BLK	SCE
1	EA	DOOR CONTACT	679-05HM	✓	BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	✓	LGR	SCE
1	EA	ELEVATION DRAWING	RISER DIAGRAM	✓		B/O
1	EA	POINT TO POINT DIAGRAM	WIRING DIAGRAM			B/O

COORDINATE WITH ELECTRICAL, FIRE AND SECURITY SYSTEMS

AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
FREE EGRESS AT ALL TIMES.

Hardware Group No. EXT-02 - STORAGE EXT.

For use on Door #(s):
123A

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ND80HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	OH STOP	70S SNB		689	GLY
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)		AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)		AA	ZER
1	EA	DOOR SWEEP	8197AA (SIZE AS REQ'D)		AA	ZER
1	EA	THRESHOLD	65A-224 (SIZE AS REQ'D)		A	ZER

Hardware Group No. EXT-03 - ELEC. RM EXT.

For use on Door #(s):
121

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	PANIC HARDWARE	78-NL-SNB		630	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)		AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)		AA	ZER
1	EA	DOOR SWEEP	8197AA (SIZE AS REQ'D)		AA	ZER
1	EA	THRESHOLD	65A-224 (SIZE AS REQ'D)		A	ZER

Hardware Group No. EXT-04 - STORAGE EXT.

For use on Door #(s):
122

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	STOREROOM LOCK	ND80HD RHO		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A RW/PA TBSRT		689	LCN
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)		AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)		AA	ZER
1	EA	DOOR SWEEP	8197AA (SIZE AS REQ'D)		AA	ZER
1	EA	THRESHOLD	65A-224 (SIZE AS REQ'D)		A	ZER

Hardware Group No. EXT-05 - EXT. DOOR DAY RM

For use on Door #(s):
118

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER		FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5 NRP		630	IVE
1	EA	POWER TRANSFER	EPT10		689	VON
1	EA	ELEC PANIC HARDWARE	RX-QEL-78-NL-SNB 24 VDC		630	VON
1	EA	SFIC RIM CYLINDER	80-159		626	SCH
1	EA	SFIC CORE	COORDINATE WITH OWNER			BES
1	EA	SURFACE CLOSER	4050A SCUSH TBSRT		689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS		630	IVE
1	EA	RAIN DRIP	142AA (SIZE AS REQ'D)		AA	ZER
1	EA	GASKETING	8303AA (SIZE AS REQ'D)		AA	ZER
1	EA	DOOR SWEEP	8197AA (SIZE AS REQ'D)		AA	ZER
1	EA	THRESHOLD	65A-224 (SIZE AS REQ'D)		A	ZER
1	EA	CARD READER W/ KEYPAD	MTK15 12 VDC (PROVIDED BY SECURITY CONTRACTOR)		BLK	SCE
1	EA	DOOR CONTACT	679-05HM		BLK	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC		LGR	SCE
1	EA	ELEVATION DRAWING	RISER DIAGRAM			B/O
1	EA	POINT TO POINT DIAGRAM	WIRING DIAGRAM			B/O

COORDINATE WITH ELECTRICAL, FIRE AND SECURITY SYSTEMS

AUTHORIZED CREDENTIAL MOMENTARILY RETRACTS LATCHBOLT, ALLOWING ENTRY.
KEY IN OUTSIDE TRIM RETRACTS LATCH FOR ENTRY ONLY. DOOR RE-SECURES WHEN KEY IS REMOVED.
RX SWITCH (INTEGRAL TO LOCKING HARDWARE) MONITORS AUTHORIZED EGRESS.
DOOR CONTACT MONITORS WHEN DOOR OPENS AND CLOSES.
ON LOSS OF POWER, ELECTRIFIED HARDWARE IS DISABLED. DOOR IS POSITIVELY LATCHED AND TRIM REMAINS SECURE.
FREE EGRESS AT ALL TIMES.

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Glass products.
2. Insulating glass.
3. Glazing tapes.
4. Miscellaneous glazing materials.

1.2 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 in accordance with ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.3 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances to achieve proper safety margins for glazing retention under each design load case, load case combination, and service condition.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of glass product other than clear monolithic vision glass; **12 inches** square.

1. Coated glass.

C. Glazing Accessory Samples: For sealants, in **12-inch** lengths. Install sealant Samples between two strips of material representative in color of adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturers of fabricated glass units.

B. Product Certificates: For glass.

C. Product Test Reports: For Coated glass and insulating for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified glazing contractor for this Project who is certified under the North American Contractor Certification Program (NACC) for Architectural Glass & Metal (AG&M) contractors and who employs glazing technicians certified under the Architectural Glass and Metal Technician (AGMT) certification program.

B. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

C. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. 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. Protect glazing materials in accordance with manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below **40 deg F**.

1.10 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty for 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 obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other

defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined in accordance with the IBC and ASTM E1300:

1. Design Wind Pressures: As indicated on Drawings.

a. Wind Design Data: As indicated on Drawings.
b. Basic Wind Speed: 110 mph.
c. Importance Factor: 1.0.
d. Exposure Category: B.

2. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or **1 inch**, whichever is less.

D. Safety Glazing: 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, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
3. U-Factors: Comply with the requirements of the 2015 IECC and Georgia Amendments for Climate Zone 3.
4. SHGC and Visible Transmittance: Center-of-glazing values, in accordance with NFRC 200 and based on most current non-beta version of LBL's WINDOW computer program. Comply with the requirements of the 2015 IECC and Georgia amendments for Climate zone 3.
5. Visible Reflectance: Center-of-glazing values, in accordance with NFRC 300.

2.2 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing

with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

C. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm.
2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

2.3 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Class 1 (clear), Quality-Q3.

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. AGC Glass Company North America, Inc.
b. Cardinal Glass Industries, Inc.
c. Guardian Glass LLC
d. Pilkington North America; NSG Group

B. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

C. Reflective- and Low-E-Coated Vision Glass: ASTM C1376.

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. Cardinal Glass Industries, Inc.
b. Guardian Glass LLC
c. Pilkington North America; NSG Group

D. Reflective- and Low-E-Coated Spandrel Glass: ASTM C1376, Kind CS.

2.4 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified in accordance with ASTM E2190.

1. Sealing System: Dual seal, with manufacturer's standard primary and secondary sealants.

2. Desiccant: Molecular sieve or silica gel, or a blend of both.

2.5 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range of industry colors.

2.6 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 804.3 tape, where indicated.
2. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
3. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, recommended in writing by manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks:

1. Neoprene with Shore A durometer hardness of 85, plus or minus 5.

D. Spacers:

1. Neoprene blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks:

1. Neoprene with Shore A durometer hardness per manufacturer's written instructions.

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.

a. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

F. Provide spacers for glass lites where length plus width is larger than **50 inches**.

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to 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.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and in accordance with requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

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 a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended in writing 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 necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit 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. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket 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. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended in writing by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 CLEANING AND PROTECTION

A. Immediately after installation, remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

3.7 MONOLITHIC GLASS SCHEDULE

A. Clear Glass Type : Fully tempered float glass.

1. Minimum Thickness: 6 mm.
2. Safety glazing required.

3.8 INSULATING GLASS SCHEDULE

A. Low-E-Coated, Clear Insulating Glass Type :

1. Overall Unit Thickness: 1 inch.
2. Minimum Thickness of Each Glass Lite: 6 mm.
3. Outdoor Lite: Fully tempered float glass.
4. Interspace Content: Argon.
5. Indoor Lite: Fully tempered float glass.
6. Low-E Coating: Sputtered on second surface.
7. Winter Nighttime U-Factor. Comply with 2015 IEC and Georgia Amendments for Climate Zone 3.
8. Summer Daytime U-Factor: Comply with 2015 IECC and Georgia amendments

for climate Zone 3.

9. Visible Light Transmittance: Comply with 2015 IECC and Georgia Amendments for climate Zone 3.
10. SGHC: Comply with 2015 IECC and Georgia Amendments for Climate Zone 3.
11. Safety glazing required.

END OF SECTION 088000

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Texture finishes.

B. Related Requirements:

1. Section 061600 "Sheathing" for gypsum sheathing for exterior walls.

1.2 ACTION SUBMITTALS

A. Product Data: For the following:

1. Gypsum wallboard.
2. Gypsum board, Type X.

B. Shop Drawings: Show locations and installation of control and expansion joints, including plans, elevations, sections, details of components, and attachments to other work.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in **12-inch-** long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

D. Samples for Initial Selection: For each type of trim accessory indicated.

E. Samples for Verification: For the following products:

1. Trim Accessories: Full-size Sample in **12-inch-** long length for each trim accessory indicated.
2. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.3 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.

1.4 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

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

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated in accordance with ASTM E90 and classified in accordance with ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Gypsum Wallboard: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, **products by one of 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**

B. Gypsum Board, Type X: ASTM C1396/C1396M.

1. Manufacturers: Subject to compliance with requirements, **provide products by one of 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**

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: **Galvanized or aluminum-coated steel sheet or rolled zinc**
2. Shapes:

    a. Cornerbead.
    b. Bullnose bead.
    c. LC-Bead: J-shaped; exposed long flange receives joint compound.
    d. L-Bead: L-shaped; exposed long flange receives joint compound.
    e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
    f. Expansion (control) joint.
    g. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Exterior Trim: ASTM C1047.

1. Material: **Hot-dip galvanized-steel sheet**
2. Shapes:

    a. Cornerbead.
    b. LC-Bead: J-shaped; exposed long flange receives joint compound.
    c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475/C475M.

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 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**, 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** compound.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use **sandable topping** compound.
4. Finish Coat: For third coat, use**, sandable topping** compound.
5. Skim Coat: For final coat of Level 5 finish, use **sandable topping compound**

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 by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:

1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.
2. Cementitious Backer Units: As recommended 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 for directly adhering gypsum panels to continuous substrate.

C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.

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 by panel manufacturer.

D. Sound-Attenuation Blankets: ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content: Postconsumer recycled content plus one-half of pre consumer recycled content not less than 25 percent.

E. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 INSTALLATION AND FINISHING OF PANELS, GENERAL

A. Comply with ASTM C840.

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 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. Wallboard Type: **As indicated on Drawings**
2. Type X: **As indicated on Drawings**
3.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels **perpendicular to framing** unless

otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. 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 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 stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints unless otherwise indicated 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**

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.

3.4 INSTALLATION OF EXTERIOR GYPSUM PANELS FOR CEILINGS AND SOFFITS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with **1/4-inch** open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 FINISHING OF GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare

gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints **beveled edges,** and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and 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**
3. Level 3: **Where indicated on Drawings**
4. Level 4: **At panel surfaces that will be exposed to view unless otherwise indicated**

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

5. Level 5: **Where indicated on Drawings**

    a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

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

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093013 - CERAMIC TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Porcelain tile.
2. Glazed wall tile.
3. Thresholds.
4. Crack isolation membranes.
5. Setting material.
6. Grout materials.

B. Related Requirements:

1. Section 079200 "Joint Sealants" for sealing of movement joints in tile surfaces.

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 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For tile, grout, and accessories involving color selection or shade variation.

C. Samples for Verification:

1. Stone thresholds in **6-inch** lengths.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of product, including product use classification.

B. Product Test Reports:

1. Tile-setting and -grouting products.
2. Certified porcelain tile.
3. Slip-resistance test reports from qualified independent testing agency.

C. Field Quality-Control Reports: Water test reports of membrane in wet areas.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. 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.

1.6 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.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Tile: Obtain tile of each type and color or finish 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. 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 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.

B. 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.

2.3 PORCELAIN TILE

A. Porcelain Tile Type:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Trinity Tile – Simplex - see drawings for locations and pattern:
2. Certification: Tile certified by the Porcelain Tile Certification Agency.
3. Face Size: 2 by 8 inches.
4. Face Size Variation: Rectified.
5. Thickness: 6 mm.
6. Product Use Classification: Interior, Wet (IW).
7. Tile Color, Glaze, and Pattern: Dark Gray Glossy
8. Grout Color: As selected by Architect from manufacturer’s full range.

2.4 POLISHED WALL TILE

A. Glazed Wall Tile Type:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Trinity Tile -Content see drawings for location and pattern:
2. Module Size: 12 by 24 inches.
3. Face Size Variation: Rectified.
4. Thickness: **8.5 mm**.
5. Tile Color and Pattern: Cement.
6. Grout Color: As selected by Architect from manufacturer’s full range.

2.5 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. Marble Thresholds: ASTM C503/C503M, with a minimum abrasion resistance of 10 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.

2.6 CRACK ISOLATION MEMBRANES

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.12 for high performance and is recommended by manufacturer for application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Crack Isolation Membrane, Fluid Applied: Liquid-latex rubber or elastomeric polymer.

1. Basis-of-Design Product: Subject to compliance with requirements, provide LATICRETE - HYDRO BAN - DS-663-0524

2.7 SETTING MATERIALS

A. Standard Dry-Set Mortar (Thinset): ANSI A118.1.

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

a. Custom Building Products
b. Laticrete International, Inc.
c. MAPEI Corporation

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. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less.

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. Custom Building Products
b. Laticrete International, Inc.
c. MAPEI Corporation

2. Provide product capable of withstanding continuous and intermittent exposure to temperatures of up to **140 and 212 deg F**, respectively, and certified by manufacturer for intended use.

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. 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.

D. 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.

E. 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 installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

3.2 PREPARATION

A. Remove coatings, including curing compounds or other coatings, that are incompatible with tile-setting materials.

B. 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.

C. 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.

D. 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.

3.3 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.

3.4 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.

END OF SECTION 093013

SECTION 095123 - ACOUSTICAL TILE CEILINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Acoustical tiles.
2. Metal suspension system.
3. Metal edge moldings and trim.

B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Samples: For each exposed product and for each color and texture specified, **6 inches** in size.

C. Samples for Initial Selection: For components with factory-applied finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of sizes indicated below:

1. Acoustical Tiles: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: 6-inch- long Sample of each type.
3. Exposed Moldings and Trim: Set of 6-inch- long Samples of each type and color.

1.3 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 tile.
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.

7. Show operation of hinged and sliding components adjacent to acoustical tiles.

1.4 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 tiles equal to 2 percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to 2 percent of quantity installed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, 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 tiles, permit them to reach room temperature and a stabilized moisture content.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile 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 tile ceiling installation.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations for Suspended Acoustical Tile Ceiling System: Obtain each type of acoustical ceiling tile and its suspension system from single source from single manufacturer.

B. Source Limitations for Directly Attached Acoustical Tile Ceiling Tile: Obtain each type of acoustical ceiling tile from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. 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 in accordance with ASTM E1264.
2. Smoke-Developed Index: 50 or less.

B. 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 TILES

A. Acoustical Tiles:

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. Armstrong World Industries
b. USG Corporation

2. Acoustical Tile Standard: Provide Armstrong – 574HRC - Cirrus.
3. Recycled Content: Postconsumer recycled content plus one-half of pre consumer recycled content not less than 25 percent.
4. Color: White.
5. Edge/Joint Detail: Square lay-in.
6. Thickness: ¾ inch.
7. Modular Size: 24 inch by 24 inch
8. NRC rating:0.70.
9. 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. Concealed or Semi-Exposed Metal Suspension System:

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. Armstrong Ceiling & Wall Solutions
    b. USG Corporation

2. Metal Suspension-System Standard: Provide Armstrong Prelude 15/16 inch, direct-hung, fully concealed, metal suspension system and accessories of type, structural classification, and finish indicated that complies with applicable requirements in ASTM C635/C635M.

    a. High-Humidity Finish: Where indicated, provide coating tested and classified for "severe environment performance" in accordance with ASTM C635/C635M.

3. Direct-Hung, Double-Web Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, pre-painted, electrolytically zinc coated, or hot-dip galvanized, **G30** coating designation.

    a. Structural Classification: Heavy-duty system.
    b. Access: Upward and end pivoted side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

        1) Initial Access Opening: In each module, 24 by 24 inches.

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 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: Post installed expansion 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.

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. 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 0.135-inch- 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.

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:

   a. Armstrong Ceiling & Wall Solutions
   b. USG Corporation

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 complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for 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.
   c. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
   d. Finish: Painted to match color indicated by manufacturer's designation.

2.7 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended in writing by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.

B. Staples: **5/16-inch-** long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

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

3.2 PREPARATION

A. Testing Substrates: Before adhesively bonding tiles to wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

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

C. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. Install suspended acoustical tile ceilings in accordance with ASTM C636/C636M and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated

temperatures.

5. 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. 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.
9. 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 tiles.

1. Screw attach moldings to substrate at intervals not more than **16 inches** o.c. and not more than **3 inches** from ends. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.
2. Install tiles with pattern running in one direction parallel to short axis of space.
3. Install tiles in a basket-weave pattern.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges of tiles so tile-to-tile joints are interlocked.

1. Fit adjoining tiles to form flush, tight joints. Scribe and cut tiles for accurate fit at borders and around penetrations through ceiling.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tiles and moldings, spaced **12 inches** o.c.
3. 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, non-cumulative.

B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

END OF SECTION 095123

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Thermoplastic-rubber base.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than **12 inches** long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than **12 inches** long.

1.3 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.4 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**.

1.5 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following periods:

1. 48 hours before installation.

2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

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

PART 2 - PRODUCTS

2.1 THERMOPLASTIC-RUBBER BASE

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

1. Johnsonite; a Tarkett company
2. Roppe Corporation; Roppe Holding Company

B. Product Standard: ASTM F1861, Type TP (rubber, thermoplastic).

1. Group: I (solid, homogeneous).
2. Style and Location:

a. Style A, Straight: Provide in areas with carpet.
b. Style B, Cove: Provide in areas with resilient floor coverings.
c. Style C, Butt to: Provide in areas indicated.
d. Style D, Sculptured: Provide in areas indicated.

C. Thickness: 0.125 inch.

D. Height: 4 inches.

E. Lengths: Cut lengths 48 inches long or coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Colors: As indicated by manufacturer's designations.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland-cement-based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for

resilient products and substrate conditions indicated.

C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to 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 10 pH.

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 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. 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 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 in length.

    a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from 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. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519 - RESILIENT TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vinyl composition floor tile.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each type of resilient floor tile.

1. Include floor tile 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 floor tile required.

D. Samples for Initial Selection: For each type of floor tile indicated.

E. Samples for Verification: Full-size units of each color and pattern of floor tile required.

F. Product Schedule: For floor tile.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials**, from the same product run,** that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Floor Tile: Furnish one box for every **50** boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.

1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than **50 deg F** or more than **90 deg F**. Store floor tiles on flat surfaces.

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than **65 deg F** or more than **85 deg F**, in spaces to receive floor tile 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 **65 deg F**r more than **85 deg F.**

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For resilient floor tile, as determined by testing identical products according to ASTM E648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 VINYL COMPOSITION FLOOR TILE

A. Manufacturers: Subject to compliance with requirements, Basis-of Design Products: Provide – Interface – Brushed Lines

1. **Interface**

B. Tile Standard: ASTM F1066, **Class 3, surface pattern**.

C. Wearing Surface: **Embossed**.

D. Thickness: 4.5 mm.

E. Size: **9.845 by 39.38 inches**.

F. Colors and Patterns: LVT-1 A01604 Galena, LVT-2 – A01608 Sandalwood

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 floor tile manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.

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 floor tile.

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

3.2 PREPARATION

A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to 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 floor tile manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile 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 **10** pH.

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 floor tiles 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 floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.

1. Lay tiles **square with room axis**

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.

1. Lay tiles **with grain running in one direction**

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. 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.

H. Adhere floor tiles 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.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile 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 floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Joint Sealant: Apply sealant to resilient terrazzo floor tile perimeter and around columns, at door frames, and at other joints and penetrations.

E. Cover floor tile until Substantial Completion.

END OF SECTION 096519

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Carpet tile.

B. Related Requirements:

1. Section 096513 "Resilient Base and Accessories" for resilient wall base and accessories installed with carpet tile.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

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 recommendations for each type of substrate.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of carpet tile.

1. Include Samples of exposed edge, transition, and other accessory stripping involving color or finish selection.

C. Samples for Verification: Actual sample of finished products for each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: **12-inch-** long Samples.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

B. Qualification Statements: For Installer.

C. Sample Warranties: For carpet tile.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.6 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at levels planned for building occupants during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended in writing by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.7 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

    a. More than 10 percent loss of face fiber, edge raveling, snags, and runs.
    b. Loss of tuft-bind strength.
    c. Excess static discharge.
    d. Delamination.
    e. Dimensional instability.

3. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis-of-Design Product: Subject to compliance with requirements, provide

INTERFACE SR799, 104918 Midnight or comparable product by one of the following:

1. Interface, Inc.

B. Color: As selected by Architect from manufacturer's full range.

C. Fiber Content: 100 percent nylon 6.

D. Pile Characteristic: Tufted Textured Loop Pile pile.

E. Density: **26 oz./cu. yd.**.

F. Pile Thickness: 0.14 for finished carpet tile in accordance with ASTM D6859.

G. Stitches: **10.**.

H. Gage: **1/1**.

I. Surface Pile Weight: **6,545 oz./sq. yd.**.

J. Primary Backing/Back coating: Manufacturer's standard composite materials.

K. Size: 19.69 in x 19.69 in.

L. Applied Treatments:

1. Soil-Resistance Treatment: Manufacturer's standard treatment.

M. Performance Characteristics:

1. Texture Appearance Retention Rating (TARR): Severe traffic, 3.5 minimum in accordance with ASTM D7330.
2. Dry Breaking Strength: Not less than **100 lbf** in accordance with ASTM D2646.
3. Dimensional Tolerance: Within **1/32 inch** of specified size dimensions, as determined by physical measurement.
4. Colorfastness to Crocking: Not less than 4, wet and dry, in accordance with AATCC 165.
5. Colorfastness to Light: Not less than 4 after 60 AFU (AATCC fading units) in accordance with AATCC 16.3 Option 3.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended in writing by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive types to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and that are recommended in writing by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width

shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

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

3.2 PREPARATION

A. General: Comply with CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates.

B. Use trowelable leveling and patching compounds, in accordance with manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions **1/8 inch** wide or wider, and protrusions more than **1/32 inch** unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: 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 adhesive and carpet tile manufacturers.

D. Metal Substrates: Clean grease, oil, soil and rust, and prime if recommended in writing by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye-lot integrity. Do not mix dye lots in same area.

D. Maintain pile-direction patterns recommended in writing by carpet tile manufacturer.

E. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended in writing by carpet tile manufacturer.

F. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

G. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on carpet tile as marked on subfloor. Use nonpermanent, nonstaining marking device.

H. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

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

1. Remove excess adhesive and other surface blemishes using cleaner recommended in writing 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 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099114 - EXTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation of substrates and application of the following:

1. Exterior paint systems.

B. Related Requirements:

1. Section 099124 "Interior Painting (MPI Standards)."
2. Section 099301 "Staining and Transparent Finishing (MPI Standards)" for surface preparation and application of wood stains and transparent finishes on exterior wood substrates.

1.2 DEFINITIONS

A. MPI Gloss Level G1: Not more than five units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level G2: Not more than 10 units at 60 degrees and between 10 to 35 units at 85 degrees, in accordance with ASTM D523.

C. MPI Gloss Level G3: Between 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level G4: Between 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

E. MPI Gloss Level G5: Between 35 to 70 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level G6: Between 70 to 85 units at 60 degrees, in accordance with ASTM D523.

G. MPI Gloss Level G7: More than 85 units at 60 degrees, in accordance with ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Include preparation requirements and application instructions.

3. Indicate VOC content.

B. Samples: For each type of topcoat product.

1.4 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.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F**.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than **5 deg F** above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 EXTERIOR PAINTS, GENERAL

A. Exterior Paint Systems: Subject to compliance with requirements, **available products that may be incorporated into the Work include but are not limited to products** listed in applicable exterior painting schedule articles for the paint category 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. Benjamin Moore & Co.
b. PPG Paints; PPG Industries, Inc.
c. Sherwin-Williams Company (The)
d. Valspar; a brand of The Sherwin-Williams Company

B. MPI Standards: Provide products complying with MPI standards indicated in applicable exterior painting schedule articles and listed in the "MPI Approved Products List."

C. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

D. Colors: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Cementitious Composition Board: 12 percent.
3. Masonry (Clay and CMU): 12 percent.
4. Wood: 15 percent.
5. Portland Cement Plaster (Stucco): 12 percent. Verify that plaster is fully cured.

C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for exterior use in paint system indicated.
2. Sand surfaces that will be exposed to view and remove sanding dust.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION OF EXTERIOR PAINT PRODUCTS

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in applicable exterior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view:

a. Uninsulated metal piping.
b. Uninsulated plastic piping.
c. Pipe hangers and supports.
d. Metal conduit.
e. Plastic conduit.
f. Tanks that do not have factory-applied final finishes.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINTING SCHEDULE, CEMENTITIOUS SUBSTRATES

A. Cementitious Composition Board Substrates: Trim .

1. Latex System: MPI EXT 3.3A.

a. Prime Coat: Latex, exterior, matching topcoat.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semigloss (MPI Gloss Level G5), MPI #11.

3.6 EXTERIOR PAINTING SCHEDULE, METAL SUBSTRATES

A. Steel and Iron Substrates:

1. Water-Based Light Industrial Coating System: MPI EXT 5.1B.

a. Prime Coat: Primer, zinc rich, inorganic, MPI #19.
b. Shop-Applied Prime Coat: Shop primer specified in Section where substrate is specified.
c. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
d. Topcoat: Light industrial coating, exterior, water based, semigloss (MPI Gloss Level G5), MPI #163.

B. Galvanized-Metal Substrates:

1. Latex System: MPI EXT 5.3H.

a. Water-Based Prime Coat: Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, exterior, matching topcoat.
c. Topcoat: Latex, exterior, semigloss (MPI Gloss Level G5), MPI #11.

END OF SECTION 099114

SECTION 099124 - INTERIOR PAINTING (MPI STANDARDS)

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation of substrates and application of the following:

1. Interior paint systems.

1.2 DEFINITIONS

A. MPI Gloss Level G1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.

B. MPI Gloss Level G2: Not more than 10 units at 60 degrees and between 10 to 35 units at 85 degrees, in accordance with ASTM D523.

C. MPI Gloss Level G3: Between 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.

D. MPI Gloss Level G4: Between 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.

E. MPI Gloss Level G5: Between 35 to 70 units at 60 degrees, in accordance with ASTM D523.

F. MPI Gloss Level G6: Between 70 to 85 units at 60 degrees, in accordance with ASTM D523.

G. MPI Gloss Level G7: More than 85 units at 60 degrees, in accordance with ASTM D523.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
2. Indicate VOC content.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, **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.

1.4 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.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between **50 and 95 deg F**.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than **5 deg F** above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 INTERIOR PAINTS, GENERAL

A. Interior Paint Systems: Subject to compliance with requirements, available products that may be incorporated into the Work include but are not limited to products listed in the applicable interior painting schedule articles for the paint category indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Benjamin Moore & Co.
b. PPG Paints; PPG Industries, Inc.
c. Sherwin-Williams Company (The)

B. MPI Standards: Provide products complying with MPI standards indicated in applicable interior painting schedule articles and listed in the "MPI Approved Products List."

C. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, products must be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

D. Colors: As selected by Architect from manufacturer's full range.

1. 10 percent of surface area will be painted with deep tones.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Cementitious Composition Board: 12 percent.
3. Masonry (Clay and CMUs): 12 percent.
4. Wood: 15 percent.
5. Gypsum Board: 12 percent. Verify that finishing compound is dry and sanded smooth.
6. Plaster: 12 percent. Verify that plaster is fully cured.

C. Verify suitability of substrates, including surface conditions and compatibility, with finishes and primers. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if

moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized Metal Substrates: Remove grease and oil residue from galvanized metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots. Before applying primer, apply coat of knot sealer recommended in writing by topcoat manufacturer for interior use in paint system indicated.
2. Sand surfaces that will be exposed to view and remove sanding dust.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION OF INTERIOR PAINT PRODUCTS

A. Apply paints in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Paint entire exposed surface of window frames and sashes.
5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
6. Primers specified in applicable interior painting schedule articles may be omitted on items that are factory primed or factory finished if compatible with intermediate and topcoat coatings and acceptable to intermediate and topcoat paint manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush

marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire-Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed to view in occupied spaces:

a. Equipment, including panelboards.
b. Uninsulated metal piping.
c. Uninsulated plastic piping.
d. Pipe hangers and supports.
e. Metal conduit.
f. Plastic conduit.
g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
h. Other items as directed by Architect.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.
3. Cost of retesting is Contractor's responsibility.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Do not clean equipment with free-draining water and prevent solvents, thinners, cleaners, and other contaminants from entering into waterways, sanitary and storm drain systems, and ground.
2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
3. Allow empty paint cans to dry before disposal.
4. Collect waste paint by type and deliver to recycling or collection facility.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by

Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Gypsum Board and Plaster Substrates:

1. High Performance Architectural Latex System, MPI, INT 9.2B.

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 1), MPI #143.
d. Topcoat: Latex, interior, high performance architectural (MPI Gloss Level 3), MPI #139.

B. CMU Substrates:

1. High Performance Architectural latex System, MPI INT 4.2D:

a. Block Filler: Latex, interior/exterior, MPI #4.
b. Intermediate Coat: Latex, interior, high performance architectural, matching top coat.
c. Top Coat: latex, interior, high performance architectural (MPI Gloss level 3), MPI#139.

C. Galvanized-Metal Substrates:

1. High-Performance Architectural Latex System, MPI INT 5.3M:

a. Prime Coat: Primer, galvanized, water based, MPI #134.
b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
c. Topcoat: Latex, interior, high performance architectural, semigloss (MPI Gloss Level 5), MPI #141.

D. Wood Substrates: Wood trim

1. Prime Coat: Primer, latex, for interior wood, MPI#39.
2. Intermediate coat: Latex, interior, high performance architectural, matching topcoat.
3. Topcoat: Latex, interior, high performance architectural, semigloss (MPI Gloss Level 5), MPI# 141.

END OF SECTION 099124

SECTION 099300 - STAINING AND TRANSPARENT FINISHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Transparent finishes.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of exposed finish.

C. Samples for Verification: Sample for each type of finish system and in each color and gloss of finish required on representative samples of actual wood substrates.

1. Size: 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.

D. Product List: Cross-reference to finish system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.3 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.

1.4 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between **50 and 95 deg F**.

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than **5 deg F** above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Source Limitations: Obtain each coating product from single source from single manufacturer.

2.2 STAINING AND TRANSPARENT FINISHING

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. Benjamin Moore & Co.
2. Lenmar Lacquers; Benjamin Moore & Co.
3. PPG Paints; PPG Industries, Inc.
4. Sherwin-Williams Company (The)
5. MINWAX

B. Material Compatibility:

1. Provide materials for use within each coating 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.

C. Material Emissions and Pollutant Control: Not less than 85 percent of field-applied paints and coatings that are inside the weatherproofing system shall comply with the following:

D. Stain Colors: As selected by Architect from manufacturer's full range

2.3 TRANSPARENT FINISHES

A. Varnish, Interior, Water Based, Clear, Satin: Water-based clear satin coating for interior wood trim, frames, doors, paneling and cabinetry.

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. Benjamin Moore & Co.
b. Lenmar Lacquers; Benjamin Moore & Co.

c. PPG Paints; PPG Industries, Inc.
d. Sherwin-Williams Company (The)
e. MINWAX

2. Gloss and Sheen Level: Manufacturer's standard low-sheen finish

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Exterior Wood Substrates: 15 percent, when measured with an electronic moisture meter.

C. Maximum Moisture Content of Interior Wood Substrates: 10 percent, when measured with an electronic moisture meter.

D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

E. Proceed with finish application only after unsatisfactory conditions have been corrected.

1. Beginning finish application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Remove hardware, covers, plates, and similar items already in place that are removable. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and finishing.

1. After completing finishing operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean and prepare surfaces to be finished according to manufacturer's written instructions for each substrate condition and as specified.

1. Remove dust, dirt, oil, and grease by washing with a detergent solution; rinse thoroughly with clean water and allow to dry. Remove grade stamps and pencil marks by sanding lightly. Remove loose wood fibers by brushing.
2. Remove mildew by scrubbing with a commercial wash formulated for mildew removal and as recommended by stain manufacturer.

C. Interior Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Apply wood filler paste to open-grain woods to produce smooth, glasslike finish.
3. Sand surfaces exposed to view and dust off.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dry.

3.3 APPLICATION

A. Apply finishes according to manufacturer's written instructions.

1. Use applicators and techniques suited for finish and substrate indicated.
2. Finish surfaces behind movable equipment and furniture same as similar exposed surfaces.
3. Do not apply finishes over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Apply finishes to produce surface films without cloudiness, holidays, lap marks, brush marks, runs, ropiness, or other surface imperfections.

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 finish application, clean spattered surfaces. Remove spattered materials by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from finish application. Correct damage by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced finished wood surfaces.

END OF SECTION 099300

SECTION 099723 – CONCRETE AND MASONRY COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and application of concrete and masonry wall coatings.

1. Interior substrates:

a. Concrete Floors.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.
2. Include preparation requirements and application instructions.
3. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: Fore each type of coating system and each color of topcoat indicated.

1. Submit samples on actual substrate material to be coated, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system, including primers and block fillers as applicable.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: Use same designations indicated on Drawings and specified herein. Include color designations and product runs (batch numbers)

1.3 INFORMATIONAL SUBMITTALS

A. Qualification data: For manufacturer and applicator.

B. Material Certificates: For each cementitious coating, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency or performed by a qualified testing agency, for each product formulation.

1.4 MAITENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run (batch number), that match products installed and that are packaged with the protective covering for storage and identified with labels describing contents.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Current certificate holder for compliance with Iso 9001.

B. Applicator Qualifications: An entity that employs applicators and supervisors who are competent in techniques required by manufacturer for application of concrete and masonry coatings.

1. Engage an applicator who employs workers for this Project who are trained or certified by coating manufacturer for application techniques required.

1.6 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 **35 deg F and not more than 110 deg F,** in accordance with manufacturer's written instructions**.**

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.
3. Protect materials from direct sunlight.

1.7 FIELD CONDITIONS

A. Apply finishes only when temperature of surfaces to be finished and ambient air temperatures are between **45 and 95 deg F**.

B. Do not apply finishes when relative humidity exceeds 85 percent, at temperatures of less than **5 deg F** above the dew point, or to damp or wet surfaces.

C. Do not apply exterior finishes in snow, rain, fog, or mist.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair r replace traffic coating that falls in materials within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Adhesive or cohesive failures.
b. Abrasion or tearing failures.
c. Surface crazing or spalling.

d. Intrusion of water, oils, gasoline, salt, deicer chemicals, or acids into deck substrate.

2. Warranty period: One Year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Interior Product: Subject to compliance with requirements, provide Euclide Super Diamond Clear; Basecoat and Topcoat System or comparable product by one of the following:

1. Euclid Chemical.

2.2 CONCRETE AND MASONRY COATINGS

A. Material Compatibility:

1. Use materials appropriate for use with coating system that are compatible with one another and with substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Recommended coating system products in writing for each coat and topcoat manufacturer for use in coating system and on substrate indicated.

B. VOC Content: For field applications that are inside the weatherproofing system, parts 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. Non flat Paints and Coatings: 150 g/l.
3. Primers, Sealers, and Under coaters: 200 g/l.

C. Crack Fillers: Coating manufacturer’s recommended, factory-formulated, alkali-resistant primer compatible with substrate and other materials indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify suitability of substrates, including surface conditions and compatibility.

C. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.

D. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted.

1. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
2. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed.
3. 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.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk.

1. Do not coat surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in coating manufacturer's written instructions.

E. Crack Repair: Fill cracks in accordance with coating manufacturer's written instructions before coating surfaces.

1. Cracks Larger Than 1/32 inch: Cut out static cracks, voids, or honeycombing larger than 1/32 inch and patch with materials recommended in writing by coating manufacturer. Identify dynamic cracks and treat in accordance with coating manufacturer's written instructions before beginning application.

3.3 APPLICATION

A. Apply coatings in accordance with manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated. Apply additional coats until cured film has a uniform coating finish, color, and appearance. Allow each coat to dry completely between coats when applying multiple coats.
2. Coat surfaces behind movable equipment and furniture same as for similar exposed surfaces.
3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat of multiple coats of same material are to be applied. Tint undercoats similar to color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If under coats or other conditions show through topcoat, apply additional coats until cured film has a uniform finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

E. Apply coatings to prepared surfaces as soon as practicable after preparation and before subsequent surface soiling or deterioration.

F. Brush Application: Brush out and work brush coats onto surfaces in an even film, filling all pores and voids at rate recommended in writing by coating manufacturer to achieve cured material thickness indicated. Finish coat with smooth, horizontal strokes.

G. Spray Application: Spray apply coats onto surfaces in an even film, filling all pores and voids at rate recommended in writing by coating manufacturer to achieve cured material thickness indicated.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.
2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer’s written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer’s written instructions.

3.5 CLEANING AND PROTECTION

A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from coating operation until 48 hours after application. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an un-damaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or detached coated surfaces.

3.6 CONCRETE AND MASONRY COATING SCHEDULE

A. Concrete Coating System:

1. Interior Coating System:

a. Base Coat: as recommended in writing by topcoat manufacturer.
b. Topcoat: Elastomeric, pigmented, eater-based coating.

1) Euclid Super Diamond Clear.

END OF SECTION 099723

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Custodial 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.

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.

1.6 WARRANTY

A. Manufacturer's Special Warranty for Mirrors: Manufacturer agrees to repair or replace mirrors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, visible silver spoilage defects.
2. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 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.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Source Limitations: Obtain public-use washroom accessories from single source from single manufacturer.

B. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick - B-4288 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Description: Roll-in-reserve dispenser with hinged front secured with tumbler lockset.
3. Mounting: Surface mounted.
4. Operation: Theft, resistant, heavy-duty spindles. Extra roll automatically drops in place when bottom roll is depleted.
5. Capacity: Designed for 5-inch- diameter tissue rolls.
6. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Paper Towel (Folded) Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick B-262 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).
5. Lockset: Tumbler type and piano hinge.
6. Refill Indicator: Pierced slots at sides or front.

D. Soap Dispenser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick B-4112 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Description: Designed for manual operation and dispensing soap in liquid or lotion form.
3. Mounting: Vertically oriented, surface mounted.
4. Capacity: 40-fl oz.
5. Materials: Satin Finish Stainless steel.
6. Lockset: Tumbler type.
7. Refill Indicator: Window type.

E. Grab Bar:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick B-6806x36 and B-6806x24 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel, **0.05 inch** thick.

a. Finish: Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

F. Corner Grab Bar:

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick B-6861 (16x31x1.5) or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless Steel, 0.55 inch thick

a. Finish:, Smooth, ASTM A480/A480M No. 4 finish (satin) on ends and slip-resistant texture in grip area.

4. OD: 1-1/2 inches.
5. Configuration and Length: As indicated on Drawings.

G. Surface-Monted Towel Shelf with Towel Bar

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick – B676x24 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc.
c. Bradley Corporation

2. Description: Surface-mounted towel shelf with four stainless steel tubes, 5/6 inch square, mounted in support arms.

a. Towel Bar: 5/16 inch square stainless steel towel bar below shelf.

3. Length: 24 inches.
4. Material and Finish: Stainless steel, ASTM A480/A480M No.7 finish (polished)

H. Surface-Mounted Toiletry Shelf

1. Basis-of Desig Product: Subject to compliance with requirements, provide Bobrick B-683x24 or comparable product by one of the following:

a. ASI-American Specialties, Inc
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Description: Fixed rectangular unit
3. Nominal size: 24 inches long by 4-3/4 inch wide
4. Material and Finish: Stainless Steel, ASTM A480/A480M no.7 finish (polished)

I. Mirror Unit:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick - B290 - 1836 or comparable product by one of the following:

a. ASI-American Specialties, Inc.
b. Bobrick Washroom Equipment, Inc
c. Bradley Corporation

2. Frame: Stainless steel angle, 0.05 inch thick.

    a. Corners: Manufacturer's standard.

3. Size: As indicated on Drawings.
4. Hangers: Manufacturer's standard rigid, tamper and theft resistant.

J. Hook:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick B212 or comparable product by one of the following:

    a. ASI-American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc
    c. Bradley Corporation

2. Description: Combination door bumper and coat hook.
3. Mounting: Exposed.
4. Material and Finish: Solid aluminum casting.

K. Shower Curtain Rod:

1. Basis-of-Design product: Subject to compliance with requirements, provide Bobrick B6107x48 or comparable product by one of the following:

    a. ASI-American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation

2. Description: 1-inch OD, straight rod.
3. Configuration: As indicated on drawings
4. Mounting Flanges: Exposed fasteners; in material and finish matching rod.
5. Rod Material and Finish: Stainless steel, ASTM A480/A480M no. 4 finish (satin)

L. Vinyl Shower Curtain:

1. Basis-of Design Product: Subject to compliance with requirements, provide Bobrick 204-3 or comparable product by one of the following:

    a. ASI-American Specialties, Inc.
    b. Bobrick Washroom Equipment, Inc.
    c. Bradley Corporation

2. Size: Minimum 12 inches wider than opening by 72 inches tall.
3. Material: Opaque, matte white vinyl, .008 inch thick, antibacterial and flame retardant.
4. Color: White
5. Grommets: Corrosion resistant at a minimum 6 inches o.c. through top hem.
6. Shower Curtain Hooks: Chrome-plated or stainless steel, spring wire curtain hooks with snap fasteners. Provide one hook per grommet

2.3 CUSTODIAL ACCESSORIES

A. Source Limitations: Obtain custodial accessories from single source from single manufacturer.

B. Custodial Utility Shelf:

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. ASI-American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc
   c. Bradley Corporation

2. Description: With exposed edges turned down not less than **1/2 inch** and supported by two triangular brackets welded to shelf underside.
3. Size: 16 inches long by 6 inches deep.
4. Material and Finish: Not less than nominal **0.05-inch-** thick stainless steel, ASTM A480/A480M No. 4 finish (satin).

C. Custodial Mop and Broom Holder:

1. Basis-of-Design Product: Subject to compliance with requirements, provide Bobrick B-223x24 or comparable product by one of the following:

   a. ASI-American Specialties, Inc.
   b. Bobrick Washroom Equipment, Inc
   c. Bradley Corporation

2. Description: Anti-slip mop holders with spring loaded rubber cam.
3. Length: 24 inches.
4. Mop/Broom Holders: Three, spring-loaded, rubber hat, cam type.
5. Material and Finish: Stainless steel, ASTM A480/A480M No. 4 finish (satin).

2.4 MATERIALS

A. Stainless Steel: ASTM A240/A240M or ASTM A666, Type 304, **0.031-inch-** minimum nominal thickness unless otherwise indicated.

B. 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.

C. 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 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 102800

SECTION 104413 - FIRE PROTECTION CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-protection cabinets for the following:

a. Portable fire extinguisher.

B. Related Requirements:

1. Section 104416 "Fire Extinguishers" for portable, hand-carried fire extinguishers accommodated by fire-protection cabinets.

1.2 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-, semi recessed-, 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, semi recessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.3 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

PART 2 - PRODUCTS

2.1 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.

2.2 FIRE-PROTECTION CABINET

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. Babcock-Davis
2. Guardian Fire Equipment, Inc
3. JL Industries; Activar Construction Products Group, Inc.
4. Larsen's Manufacturing Company
5. Nystrom, Inc.
6. Potter Roemer LLC; a Division of Morris Group International

B. Fire-Protection Cabinet Type: Suitable for fire extinguisher

C. Cabinet Construction: Non rated,One-hour fire rated and 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

1. Shelf: Same metal and finish as cabinet.

E. Semi recessed 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.

F. Cabinet Trim Material: same material and finish as door.

G. Door Material: Steel sheet.

H. Door Style: Fully glazed, frameless, backless, acrylic panel.

I. Door Glazing: Tempered float glass (clear)

1. Acrylic Sheet Color:

a. Clear transparent acrylic sheet.

J. 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 door pull and friction latch.
2. Provide continuous hinge, of same material and finish as trim, ~~,~~ permitting door to open 180 degrees.

K. 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. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated.

    a. Identify fire extinguisher in fire-protection cabinet with the words "FIRE EXTINGUISHER."

        1) Location: Applied to cabinet glazing.
        2) Application Process: Pressure-sensitive vinyl letters.
        3) Lettering Color: Red.
        4) Orientation: Vertical.

L. Materials:

1. Cold-Rolled Steel: ASTM A1008/A1008M, Commercial Steel (CS), Type B.

    a. Finish: 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: As selected by Architect from manufacturer's full range.

2. Transparent Acrylic Sheet: ASTM D4802, Category A-1 (cell-cast sheet), 6 mm thick, with Finish 1 (smooth or polished).

2.3 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 of one-piece construction with edges flanged.
2. 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.

2.4 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 walls and partitions for suitable framing depth and blocking where **semi recessed** cabinets will be installed.

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

3.2 PREPARATION

A. Prepare recesses for **semi recessed** 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 heights acceptable to authorities having jurisdiction.

1. Fire-Protection Cabinet Mounting Height: 42 inches 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 semi recessed fire-protection cabinets.

2. Fasten mounting brackets to inside surface of fire-protection cabinets, square and plumb.
3. Fire-Rated Cabinets:

    a. Install cabinet with not more than **1/16-inch** tolerance between pipe OD and knockout OD. Center pipe within knockout.

C. Identification:

1. Apply vinyl lettering at locations indicated.

END OF SECTION 104413

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

B. Related Requirements:

1. Section 104413 "Fire Protection Cabinets."

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

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.

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 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, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Ansul; brand of Johnson Controls International plc, Building Solutions North America
b. Babcock-Davis
c. Guardian Fire Equipment, Inc
d. JL Industries; Activar Construction Products Group, Inc.
e. Larsen's Manufacturing Company
f. Nystrom, Inc.
g. Potter Roemer LLC; a Division of Morris Group International

2. Source Limitations: Obtain fire extinguishers, fire-protection cabinets, and accessories, from single source from single manufacturer.
3. Valves: Manufacturer's standard.
4. Handles and Levers: Manufacturer's standard.
5. Instruction Labels: Include pictorial marking system complying with NFPA 10,

Appendix B.

B. Multipurpose Dry-Chemical Type in Steel Container : UL-rated -A:40-B:C, 5-lb nominal capacity, with monoammonium phosphate-based dry chemical in enameled-steel container.

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 above finished floor.

END OF SECTION 104416

SECTION 105123 - PLASTIC-LAMINATE-CLAD LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. 18-inch Wide Single Tier Designer Wood Lockers.

1.2 REFERENCES

A. ADAAG – Americans with Disabilities Act, Accessibility Guidelines.

B. IBC – International Building Code.

1.3 ACTION SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Prepared specifically for this project; show dimensions of lockers and interface with other products.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.4 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging, in a dry, ventilated area until ready for installation.

B. Locker components shall be stored flat until assembly. All finishes shall be protected from soiling and damage during handling.

C. Store and dispose of solvent-based material, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of lockers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of locks or hardware.
c. Deterioration of wood, finishes, and other materials beyond normal use.

2. Warranty Period: Three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Accessibility Standard: For lockers indicated to be accessible, comply with applicable provisions in **the USDOJ's "2010 ADA Standards for Accessible Design".**

2.2 PLASTIC-LAMINATE-CLAD WOOD LOCKERS

A. Basis-of Design Product: Subject to compliance with requirements, provide: Salsbury Industries, 18-21000 Series 18" Wide Single Tier Designer Wood lockers. Single Tier 18-inch wide designer wood lockers. Constructed of industrial grade particle board and covered with durable plastic laminate; includes lift handle and recessed hasp for added security, with electronic locks.

A. 18-inch Wide Designer Wood Locker Series:
18-21000 series: Single-tier.

B. Unit Width: 18 inches (457 mm).

C. Unit Height:
76 inches (1,930 mm) with bases.

D. Unit Depth:
24 inches (610 mm).

E. Unit Assembly: Requires minor assembly.

F. Laminate Color:
Mahogany - standard.

2.3 INTERIOR EQUIPMENT

A. ADA Compliant Lockers (Recessed Handles with Multi-Point Latch):
1. Single-tier:
Additional shelf at maximum 48 inches (1,219 mm) off the floor for unobstructed forward and side reach.
2. Handicapped Locker Compartment Bottom: Minimum of 15 inches (381 mm) off the floor or an extra shelf placed 15 inches (381 mm) off the floor for unobstructed forward and side reach.
3. Hooks and rods as specified.

B. Standard Hardware Features:
1. Single Tier Designer Wood Lockers:
a. Padlock hasp.
b. One top-mounted, two-pronged stainless steel coat hook.
c. One full depth hat shelf.
d. One 5 inch (127 mm) deep shelf.
e. One 11-3/4 inch (298 mm) deep shoe shelf.
f. Three heavy duty concealed door hinges.

2.4 OPTIONAL EQUIPMENT

A. Bases: 4 inches (102 mm) high.

C. Fillers:
1. Flat top fillers:
a. Flat top in-line top fillers.
b. Flat top corner fillers.
2. Front fillers:
a. 9 inch (229 mm) wide filler panels.
b. 15 inch (381 mm) wide filler panels.
c. Vertical corner fillers.

D. Side panels:
1. Single end side panels:
a. Without sloping hoods.
b. With sloping hoods.
2. Double end side panels:
a. Without sloping hoods.
b. With sloping hoods.

E. Built-In Locks:
   1. Built-in electronic locks.
   2. Built-in ADA keyed locks.

H. Additional compartment shelf.

I. Engraved name/number plates.

2.5 CUSTOMIZATION

A. Custom colors – For all custom colors available, contact Salsbury Industries or visit www.lockers.com/customdesignerlockers:
Minimum order of fifteen locker frames.

B. Ventilation grill: Improved air flow throughout locker compartment.

C. Coat rod: Additional garment storage capability.

F. Lockable interior compartment: Add protection for items.

2.6 CONSTRUCTION

A. Locker Body – Tops, bottoms, sides, backs and shelves are precision machined:
   1. Locker shall be fabricated using doweled and glued assembly process.
   2. Tops and bottoms with three sides formed to 90 degrees, the front offset formed to be flush with horizontal frame member.
   3. Shelves with four sides formed to 90 degrees.

B. Locker Doors – Doors are precision machined:
   1. Door:
      a. Doors have four radial edges.
      b. Routed inset to insert and attach number plates.
   2. Ventilation – 1/2 inch (12.7 mm) opening between door and frame on locker top and bottom provide unrestricted airflow:
      a. Customizable venting option available.
   3. Single-point latching:
      a. Recessed handle in door.
      b. Integral Pocket and Pull: 22 gauge powder coated stainless steel securely fastened to door with two lugs and a positive tamper-resistant decorative fastener.

I. Pocket Depth: Sufficient to prevent a combination padlock,
built-in combination lock, or key lock from protruding beyond door face.
II. Pull: Formed in pocket.
III. Padlock Staple: Protruding through pocket.

c. Provide lock hole cover plate for use with padlocks.
d. Locking Device: 11 gauge steel hasp welded to locker frame; include surface for engaging the bolt of a built-in combination or key lock and anti-pry lug and slot to deter prying open when locked.
e. Firmly secure rubber silencers to locker frame.

C. Fabricate locker parts square, rigid and without warp, with the finished faces flat and free of scratches and chips.

D. Fabricate corners and fillers as required for installation.

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 Salsbury Industry's installation instructions.

B. Anchor the units to the wall studs through the locker back and to the floor.

C. Lockers can be either floor-mounted or installed on concrete or wood bases as scheduled or indicated. Floor or base shall be level for proper installation.

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 105123

SECTION 105143 - WIRE MESH STORAGE LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Welded wire mesh storage lockers.

1.2 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. Shop Drawings:

1. Plans, elevations, sections, and attachment details.

C. Samples for Verification: Actual sample of finished products for each type of wire mesh storage locker with factory-applied color finishes.

1. Size: Manufacturers' standard size

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Qualification Statements: For Installer.

1.4 QUALITY ASSURANCE

A. Manufacturer shall have a minimum of fifteen years of experience in the direct manufacture of lockers.

B. Installer Qualifications: Installer shall have experience necessary to assure lockers are installed properly and according to manufacturer’s instructions.

C. Reference: Qualify procedures and personnel in accordance with the following welding codes:

1. ASTM A513 – Minimum properties of Electric-Resistance-Welded Carbon Ally

Steel Mechanical Tubing.
2. ASTM A5410 – Minimum properties of Wire Rods and Course Round Wire, Carbon Steel and Alloy Steel.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver materials to site in manufacturer's original, unopened containers with labels identifying product and manufacturer's name.

B. Storage: Store materials in a clean dry area.

C. Handling: Protect materials and finish during installation and handling to prevent damage.

1.6 FIELD CONDITIONS

A. Field Measurements: Verify actual dimensions of construction contiguous with wire mesh storage lockers by field measurements and coordinate before fabrication.

PART 2 - PRODUCTS

2.1 WELDED WIRE MESH STORAGE LOCKERS

A. Basis-of-Design Product: Acceptable Manufacturers: Subject to compliance of the contract documents, acceptable manufacturers are as follows:

1. GearGrid Corporation, 670 SW 15th Street, Forest Lake, MN 55025. Toll Free 888-643-6694. Phone 651-464-4468. Web Site www.geargrid.com, Email sales@geargrid.com
2. Additional manufacturer's may be approved; however, approval does not preclude the manufacturer from providing documentation supporting that their product meets or exceeds all aspects of this specification section. Failure to provide proper documentation will result in the rejection of submitted product.

2.2 TURNOUT GEAR LOCKER FABRICATION

A. Lockers must be fabricated and manufactured in the U.S.A. Products not manufactured in the U.S.A. will be rejected at the time of submittal.

B. Model: GEARGRID Wall mounted Storage System.

C. Locker Size:

1. Width: 24 inches
2. Depth: 20 inches
3. Height: 74.5 inches

D. Construction: Units shall be welded at all applicable joints. Forming of metal shall be completed by standard cold-forming operations. Use of fasteners will only be required to allow for knock-down shipping, securing units to mounting surface and on applicable accessories.

E. Vertical Dividers:

1. Oter Frames: 1.25 inch x 16 gage wall thickness ASTM A513 steel tubing.
2. Inner Grid: .25" diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
3. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
4. Inner Grid wires must run horizontally and vertically creating a square or rectangle grid pattern only. Grid wires not creating a square or rectangular grid pattern will not be acceptable
5. Inner Grid wire shall intersect and cross all perpendicular wires, and shall be welded at all intersections.

F. Back Panels:

1. Required on each locker to protect the locker contents and wall substrate, as well as provide an additional panel for accessory attachment.
2. Grid: .25 inch diameter ASTM 510 cold drawn steel wire resistance welded to a 3" square pattern.
3. Back panel must engage and be secured to vertical dividers via horizontal wires which extend into mounting holes pre-drilled in vertical dividers. Back panels are sandwiched between vertical dividers, preventing them from being removed after assembly.
4. Inner Grid wires must be full length and width of inside vertical divider frame. Wires not running full length or width, thus creating exposed wire ends will not be acceptable.
5. Inner Grid wires musts run horizontally and vertically creating a square or rectangular grid pattern only. Grids not creating a square or rectangular pattern will not be acceptable.
6. Inner Grid wires shall intersect and cross all perpendicular wires and shall be welded at all intersections.

G. Shelves: (1) Upper, (1) Lower. .25 inch diameter ASTM 510 cold drawn steel wire resistance welded and cold formed. Upper shelf shall include an integrated 20 gage steel bracket to accept a 2 inch x 16 inch name placard (not included), unless doors are selected as an option, in which case the name placard holder will be integrated into the door.

1. Load Capacity: **250 lb,** uniformly distributed.

H. Apparel Hooks: (3) per locker opening, .192 inch diameter ASTM 510 cold drawn steel wire resistance welded, cold formed and powder coated. Apparel hooks must securely engage and snap onto side or back grid, to prevent unintentional disengagement of hook.

2.3 ACCESSORIES:

A. Name Placard:

1. Provide 2 inch x 16” shelf name placard inscribed as directed by owner and Architect.

B. Helmet Holder:

1. ,25 inch diameter ASTM 510 cold drawn steel wire resistance welded. Powder coated finish in specified color.

2.4 FINISH

A. General: All system components excluding assembly and mounting hardware and stainless-steel components are to receive the standard finish.

B. Standard Finish: Components to be cleaned using a phosphatized bath, clear water rinse and electro-statically coated with a durable and UV-stable TGIS powder coating process. Thickness of applied finish shall be 3-4 mm for added protection.

1. Anti-Corrosive Primer:

C. Color: Red Baron

2.5 EXAMINATION

A. Examine area to receive lockers. Notify Architect if areas are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

2.6 INSTALLATION

A. Install Lockers in accordance with manufacturer’s instructions.

B. Use manufacturer’s hardware for assembly.

C. Anchor to mounting surface with proper hardware.

END OF SECTION 105143

SECTION 107300 – ALUMINUM CANOPY

PART 1 – GENERAL

1.1 SUMMARY

A. Section Includes: Helios Canopy.

B. Related Requirements: Division 1 – General Requirements

1.2 REFERENCES

A. The publications listed below form a part of this specification to the extent referenced. Publications are referenced within the text by the basic designation only.

B. American Welding Society (AWS):

1. Standard D1.2 – Structural Welding Code – Aluminum
2. American Architectural Manufacturers Association (AAMA):
3. Aluminum finishes AAMA 2603 Powder Coat
4. Aluminum finishes AAMA 2605 Kynar
5. Aluminum finishes AAMA 611 Anodize

1.3 SUBMITTALS

A. Shop Drawings: Indicate size, material and finish. Include plan elevation pages to clearly outline canopy locations. Include installation procedures, details of joints, attachments and clearances. Provide lead time for product and note possible conflicts with standard line.

B. Color charts showing manufacturer’s full range of colors from standard line.

1.4 Warranty

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal canopies that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Specifications are based on Architectural Fabrication, Inc. – Helios Canopy. Architectural Fabrication, Inc. – Manufacturer and Installer is located at 2100 E. Richmond Avenue, Fort Worth, TX 76104. 800.962.8027. www.arch-fab.com

2.2 MATERIALS

Framing: Gutter fascia, tube, angles: 6063-T5 alloy extruded aluminum

Decking: Interlocking panels, extruded aluminum or sheet metal

Hanger Rods: Zinc plated steel and powder coat (Prime and paint are not acceptable)

Connections: Wall plates and canopy mounting brackets are to be aluminum.

Hardware and Fasteners: Nuts, bolts, washers, clevis pins, screws, anchors and pipe spacers to be zinc plated or galvanized steel required to suit application.

Flashing: Shall be minimum 0.040-inch aluminum, fabricated to prevent leakage and sealed with Novaflex metal roof sealant in clear or color match. Other equivalent sealant is acceptable.

Finish: Powder coat finish per ASTM D 3451, complying with finish manufacturer's written instructions for surface preparation including pretreatment, application, baking and minimum dry film thickness. Color to be selected from standard color line.

PART 3 – EXECUTION

3.1 FABRICATION

A. Fabricate and preassemble canopies in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

3.2 INSTALLATION

A. Install canopies per manufacturer's written instructions and as indicated on drawings.

B. Locate and place canopies level, plumb and at indicated alignment with adjacent work.

C. Use concealed anchors where possible.

D. Repair damaged finishes so no evidence remains of corrective work. Return items to the factory that cannot be refinished in the field. Make required alterations and refinish entire unit or provide new units.

E. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a coating of bituminous paint or elastomeric coating on surfaces that will be in contact with concrete, masonry or dissimilar metals.

END OF SECTION

SECTION 107516 - GROUND-SET FLAGPOLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes ground-set flagpoles made from **aluminum.**

B. Owner-Furnished Material: Flags.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.

B. Shop Drawings: For each flagpole.

1. Include the following

a. Plans, elevations, and attachment details. Show general arrangement, jointing, fittings, accessories, grounding, anchoring, and support.
b. Section, and details of foundation system.

C. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

D. Delegated Design Submittals: For flagpoles.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design flagpole assemblies.

B. Structural Performance: Flagpole assemblies, including anchorages and supports, to withstand design loads indicated within limits and under conditions indicated.

1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 100 mph.

2.2 ALUMINUM FLAGPOLES

A. Exposed Height: **30 feet**

B. Construct flagpoles in one piece if possible. If more than one piece is necessary, comply with the following:

1. Fabricate shop and field joints without using fasteners, screw collars, or lead calking.
2. Provide flush hairline joints using self-aligning, snug-fitting, internal sleeves.

C. Cast-Metal Shoe Base: Made from aluminum **with same finish and color as flagpoles** for anchor-bolt mounting; furnish with anchor bolts.

1. Furnish ground spike.

2.3 FITTINGS

A. Finial Ball: Flush-seam ball, sized as indicated or, if not indicated, to match flagpole-butt diameter.

1. **0.063-inch** spun aluminum**, with gold anodic finish**.

B. External Halyard: Ball-bearing, non fouling, revolving truck assembly of cast metal with continuous **5/16-inch- diameter, braided polypropylene halyard** and **9-inch** cast-metal cleats with fasteners. Finish exposed metal surfaces to match flagpole.

1. Halyards and Cleats: **One** at each flagpole.
2. Halyard Flag Snaps: **Bronze** swivel snap hooks **with neoprene or vinyl covers**. Furnish two per halyard.

2.4 MISCELLANEOUS MATERIALS

A. Elastomeric Joint Sealant: joint sealant complying with requirements in Section 079200 "Joint Sealants."

2.5 ALUMINUM FINISHES

A. Natural Satin Finish: AA-M32, fine, directional, medium satin polish; buff complying with AA-M20; seal aluminum surfaces with clear, hard-coat wax.

B. Clear Anodic Finish: AAMA 611, **AA-M12C22A41**.

1. 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 FLAGPOLE INSTALLATION

A. General: Install flagpoles where indicated and according to **Shop Drawings and** manufacturer's written instructions.

B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a **2-inch** layer of elastomeric joint sealant and cover with flashing collar.

C. Baseplate: Cast anchor bolts in concrete foundation. Install baseplate on washers placed over leveling nuts on anchor bolts and adjust until flagpole is plumb. After flagpole is plumb, tighten retaining nuts and fill space under baseplate solidly with nonshrink, nonmetallic grout. Finish exposed grout surfaces smooth and slope 45 degrees away from edges of baseplate.

END OF SECTION 107516

SECTION 123661 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Solid surface material countertops.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of countertop material.

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.

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 **8 by 10 inches**, of construction and in configuration specified.

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 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 SOLID SURFACE MATERIAL COUNTERTOPS

A. Solid Surface Countertop Type :

1. Grade: **Premium**.

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**

a. **DuPont; DuPont de Nemours, Inc.**

2. Colors and Patterns: Dupont Corian Carbon Aggregate
3. Countertop:

a. Type: **Veneer**.
b. Thickness:

1) **1/2-inch-**thick, solid surface material **with front edge built up with same material**.

c. Exposed Edge Treatment: **Radius**
d. Backsplash: **Integral coved**

1) Height: **4 inches**
2) Thickness: **1/2 inch**

e. End Splash: **Matching backsplash**.

2.2 ACCESSORIES

A. Support Brackets:

1. Countertop:

a. Type: **Front mount**.
b. Style: Basis-of-Design: Iron Supports – Standard Front Mount Countertop L Bracket
c. Material: **Steel**
d. Color: **Black** powder coat.

2.3 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.

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.

2.4 INSTALLATION MATERIALS

A. Particleboard: ANSI A208.1, **Grade M-2-Exterior Glue**.

B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

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.

C. Adhesive: Product recommended by manufacturer.

D. Sealant for Countertops: Comply with applicable requirements in Section 079200 "Joint Sealants."

PART 3 - EXECUTION

3.1 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. 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."

END OF SECTION 123661

DIVISION 21 - FIRE PROTECTION
SECTION 210100 - SPRINKLER SYSTEM

PART 1- GENERAL

1.1 GENERAL

A. General Provisions - General and Supplementary Conditions shall apply to the work contained in this section of the specifications.

B. Qualifications of Contractor - The system shall be installed by an approved sprinkler contractor holding a current and valid State Fire Marshal's Certificate of Competence, regularly engaged in the installation of automatic sprinkler and standpipe systems, with satisfactory experience in at least three equivalent projects.

C. Scope - Furnish all labor, materials, and equipment required for complete installation of the fire protection wet type sprinkler systems in all areas of the new building as indicated on the plans. The system shall be installed complete, satisfactorily tested, and left ready for operation.

D. Codes and Regulations - All work performed under this section shall comply with the requirements of National Fire Protection Association Standards, including Pamphlets No. 13R. The installation shall also meet the requirements of N.F.P.A. Life Safety Code No. 101 and all Georgia State Minimum Standard Codes. The work shall meet the Requirements of all applicable local, state, and federal codes and regulations; and shall meet the requirements of the office of the Fire Marshall.

E. Shop Drawings - Within forty days after award of the contract submit three sets of shop drawings, complete with manufacturer's descriptive literature on equipment, and detailed hydraulic calculations. Before submitting for the Architect's approval, secure review of the office of the Local Fire Marshall. The contractor shall make all modifications and/or additions required to meet the requirement of the office of the Local Fire Marshall, at no additional charge. One set of shop drawings, with the office of the Local Fire Marshall comments shall be delivered to the Architect before any work is begun.

F. Inspection of Job Site - Bidders shall visit the site of the work before submitting bids, and satisfy themselves as to the nature and scope of the work to be done. The submission of a bid shall be taken as evidence that the bidder is aware of all existing conditions. Later claims for labor, materials, or equipment required for any difficulties encountered shall not be recognized.

G. System Design - Contractor shall be responsible for the complete design and installation of fire protection sprinkler system in accordance with all the applicable codes specified herein.

H. Coordination - It shall be the responsibility of the contractor to install piping in such a manner as to conform to structure, avoid obstructions, and observe clearances without extra cost to the owner. Prefabricated piping does not preclude coordination with other trades. Piping shall be offset, relocated, or resized; or other piping shall be furnished and installed as necessary to provide space for other trades.

The Architect assumes no responsibility for coordination by approval of shop drawings. If a conflict arises, it shall be the responsibility of the Architect to decide who has priority. The decision of the Architect shall be final. No ceiling heights shall be lowered because of limitations of space for mechanical equipment.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

A. Materials and Equipment - Material and equipment shall be the standard catalogued products of manufacturers regularly engaged in the manufacture of such products. Similar types and items of equipment shall be produced by the same manufacturer.

All materials and equipment shall be listed in Underwriters Laboratories, Inc. Fire Protection Equipment List, and shall be the latest design of the manufacturer.

B. Pipe and Fittings - All pipe and fittings shall conform to the applicable standards indicated in N.F.P.A. No. 13R

C. Sprinklers - UL Listed; quick-response sprinklers shall be standard type tested in accordance with UL-199 and UL-1626, except as noted below. The maximum distance from the deflector to finished ceiling shall be 1-7/8 inches for pendent sprinklers, except as noted below. **Pendent sprinklers in finished areas with acoustical ceiling tile shall be provided with semi-recessed adjustable escutcheons and sprinklers in finished areas with gypsum board ceilings shall be concealed pendent type**. The sprinkler shall be installed in the flush position with the element exposed below the ceiling and **shall be mounted in the center of the acoustical ceiling tile in all directions**. **The locations of sprinklers in gypsum board ceiling areas shall be coordinated with and approved by the Architect before fabrication and installation of the piping**.

At the specified locations, provide the following type of sprinklers:

LOCATION	Quick Response, Concealed Pendent, Pendent, Sidewall, Flush Sidewall, White Polyester Finish, (150-165 Degrees F.)
All Dorm Rooms	

2.2 DESIGN CRITERIA

A.Sprinkler System - Sprinklers shall be designed to meet the requirements of N.F.P.A. 13R . The contractor shall verify and obtain all site information to accomplish his design to meet the requirements of the Local Fire Marshall.

PART 3 - EXECUTION

3.1 GENERAL WORKMANSHIP

A General Workmanship - Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all windows, doors and other openings. Route though previously built-in sleeves. Ream all piping to remove burrs. Make change in direction and size with fittings (no bushings will be allowed). Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to insure unrestricted circulation and to permit complete drainage of the systems.

Provide valved drain lines throughout the sprinkler system to permit complete system drainage; furnish plugged drain outlets on all dropped sections of sprinkler branch piping. Provide sprinkler system test pipes. All of the above to be as shown on drawings and/or as required by N.F.P.A. and the local authorities. Drains and test connections to discharge through building wall as approved by Architect. Refer to, and carefully check the installation against all architectural drawings and details, and note where walls, ceilings, beams, and pipe shafts are furred or enclosed. Refer to and check with the contract drawings for the heating, ventilation, plumbing and electrical work and other work of mechanical trades.

Install all piping to be concealed in ceiling or wall construction so as not to cause delay to other work, and to allow ample time for the necessary tests and approval. All piping shall be concealed above ceilings. Hang all horizontal piping runs from construction above, and locate so as to obtain the maximum headroom. Install swing joints or expansion loops wherever necessary to allow for pipe expansion. Securely anchor pipes so that expansion can occur at these points. Take care to prevent contact between pipes and building structure which could cause noises upon pipe expansion and contraction.

B. Field Supervision - The sprinkler contractor shall have a responsible representative of his organization at the site of the work for coordination of this sprinkler installation with other trades as early as is required by the progress of the work of the project. Details of proposed departures due to field conditions and/or requirements of local codes shall receive written approval of the Architect.

C. Tests - Tests are to conform to requirements of N.F.P.A. and the authorities having jurisdiction. Records of all tests are to be made available for owner's inspection as required. Repair defects disclosed by tests, replace defective materials as required.

D. Guarantee - This contractor shall guarantee all work installed by him against all defects in materials and workmanship for a period of one year after completion and acceptance. Any defective work shall be repaired or replaced upon notification by the Architect.

END OF SECTION 210100

DIVISION 22 - PLUMBING
SECTION 220100 - PLUMBING

PART 1- GENERAL

1.1 SCOPE

A. The General Conditions of the Specifications are applicable in full hereto.

B. Include all equipment, material, labor required for complete and operating plumbing systems, even though every item involved is not included.

1.2 WORK INCLUDED

A. Work will include but will not be limited to the following systems complete with all required accessories:

1. A system of sanitary soil, waste and vent piping.
2. A system of domestic cold and hot water piping.
3. A system of LP gas piping.
4. Plumbing fixtures, equipment, accessories, trim and the like as herein specified.

1.3 LAWS AND CODES

A. The Installer will install all work in strict compliance with the 2018 International Plumbing Code, 2018 International Fuel Gas Code, 2015 International Energy Conservation Code and all Georgia Amendments. Where conflicts occur between a code and contract drawings or specifications, most stringent requirements shall apply.

B. The Installer will obtain and pay for all permits, fees and charges required incidental to the work involved that may be necessary for fully completing the work.

C. The Installer will make all necessary tests required by local authorities, legal regulations and/or the Engineer and return to the Engineer any certificate of approval issued in this district for all Plumbing work signed by the Inspecting Administrative Authority in charge of each particular part of the work.

1.4 QUALIFICATIONS

The Installer shall be an established licensed plumber with satisfactory experience in at least three (3) equivalent projects.

1.5 CHANGES AND CONFLICTS

If during construction desirable or necessary changes become apparent, advise the Engineer and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.6 DRAWINGS

In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail Architectural, Structural and Electrical Drawings, and lay out work so as to fit in with ceiling grids, lighting and other parts. Where doubt arises as to the meaning of the Plans and Specifications, obtain the Engineer's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in questions.

1.7 GUARANTEE AND SERVICE

A. The Installer will guarantee all piping, equipment, fixtures, and related materials for a period of one (1) year from date of acceptance against defects due to faulty workmanship or materials. Such defects will be corrected promptly after notification by the Engineer and at the Contractor's expense with no cost to the Owner for parts or labor.

B. The Installer will also furnish without charge any reasonable service in making minor adjustments to fixtures and equipment for the same period, but this service will not include the replacement of parts damaged by maliciousness or vandalism after acceptance by the Owner, or clearing of obstruction from sewers caused by other than defects in the line.

C. The Installer will put all items installed under this division into operation and will instruct the Owner's maintenance personnel in all points requiring service and maintenance.

1.8 EXISTING CONDITIONS

Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged misunderstanding regarding utility connections, permits, fees, etc.

1.9 PHASING

Interrupt existing services only at times approved by the Owner. Hold interruptions to the minimum in duration and frequency.

1.10 SUBMITTAL DATA

A. Within 25 days after award of contract, submit for approval a complete schedule of material and equipment proposed. Partial lists will not be considered. Include catalog data, scheduled capacities, fan curves, etc., where substitutions are proposed. Follow procedures set forth in these Specifications.

B. Upon request submit shop drawings showing proposed arrangement of equipment, duct work, piping, floor drains, power requirements, and controls. In any case, submit detail layouts of potential conflicts at plumbing drops, equipment rooms, tight ceilings, etc.

1.11 MANUALS

Furnish five (5) copies of maintenance instructions, operating instructions and parts lists for all fixtures and equipment bound into five (5) manuals, loose sheets will not be accepted.

One manual will be submitted to design engineer complete, prior to final inspection.

1.12 AS-BUILT DRAWINGS

This Contractor will keep an accurate record of any deviations from the contract plans and specifications and at the completion of the work will furnish to the Owner a set of electronic documents in AutoCAD and PDF formats reflecting all revised as-built conditions. No final inspection will be rendered until receipt of said electronic documents.

1.13 COORDINATION OF WORK WITH OTHER TRADES

A. The Installer will layout and proceed with this work so that this work will be executed in harmony with all other Contracts pertaining to this project.

B. Roof Flashing - Metal roof flashing, vent stack flashing and other related roofing work are specified under Roofing Section (but with reservation that Roofer be advised of requirements and furnished items to be installed before roofing is in place.) All roof flashings, stacks, etc., shall be painted to match the roof. **All roof flashings shall be compatible with the roof system. Contractor shall coordinate with roof system requirements.**

C. Access panels and doors - Furnish to general contractor for installation wherever required for access to valve, damper, air vent or similar device. Doors shall be suitable for wall finish involved, 12" x 16" unless otherwise indicated, fire rated where fire walls are penetrated, Milcor, Philip Carey, Zurn or other approved equal.

Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 7/8" diameter color coded equipment locator tack as manufactured by Marking Services, Inc. or a 1/2" diameter color coded self-adhesive individual marker dot as manufactured by EMED Co., Inc., with appropriate color as specified under Pipe Identification and Color Coding.

D. All electric power wiring required for installation of equipment under this Section is specified under Electrical Division. Plumbing Installer shall furnish and install all controls, and control wiring as specified or required to properly complete the installation. Control conduit is specified under Electrical Division to the extent shown on electrical drawings; all other control conduit shall be provided under this Section of the work. All electrical work performed under this Section shall meet requirements set forth in the Electrical Division. **No piping shall be installed over an electrical panel.**

E. Pipe Sleeves - Fit all pipes passing through masonry and job cast concrete (except slabs on grade) construction with sleeves. Sleeves shall be cut flush with each surface, 1/2" larger in diameter than the passing pipe or cover, built-in as work progresses. Sleeves thru joists and beams shall be of galvanized steel pipe; other sleeves shall be of 16 gauge galv. iron. Make space between floor sleeves and passing pipes watertight by caulking with fireproof packing and plastic waterproof caulking compound. Where copper pipe passes thru a slab on grade, provide a 24" long plastic pipe sleeve.

F. Cutting and patching - Openings are to be laid out and built-in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected. Otherwise walls, etc., affected must be reworked by trade which erected same at expense of Mechanical Contractor; chasing and cutting of new work will not be accepted.

   Cutouts in countertops shall be made by millwork contractor upon receipt of proper templates. Openings in existing walls shall be made by trade requiring same, with repairing and patching required thereby done by the respective trade whose work is damaged.

G. Connections for Equipment Furnished by Others
   1. Plumbing Contractor will provide floor drains required for this equipment.
   2. All required water supply lines will be extended to within 2'0" of equipment locations and terminated with a gate valve. Extension of water lines from this point, furnishing of any backflow preventers, pressure regulators, etc., and final connections to equipment will be by the Mechanical Contractor.

1.14 MISCELLANEOUS REQUIREMENTS

A. Materials and Equipment - New and of best quality in every respect. Pipe and fittings shall conform to the ASTM Standard designated for pipe of each material. Equipment shall be essentially the standard product of the manufacturer and UL approved where commercially available. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of each unit need not be.

B. Workmanship - First class and in accordance with best practice. Pipe shall be cut clean, properly reamed, threaded or soldered, erected plumb and secure. Make changes in pipe size with reducing fittings without the use of bushings. Work shall be executed by experienced mechanics and shall present a neat appearance. Install equipment in accordance with manufacturer's recommendation. At all stages of installation, protect pipe openings, fixtures, duct work and equipment against the entrance of foreign materials, and from damage by the elements, mortar, paint, etc.

C. Factory Finishes - Manufacturer's standard unless otherwise stated. Submit color cards for selection where choice exists.

D. Expansion - Provide for expansion and contraction of all piping and make proper provisions so that excessive strain will not occur on piping or other parts.

E. Safety Provisions - Provide covers or guards on all hot, moving and projecting items which would be a hazard to occupants of the building or to service personnel.

F. Cleaning and adjusting - Upon completion of work, clear all drains, traps, fixtures, ducts and pipe. Adjust all valves, pack stuffing boxes, remove rubbish and leave work in clean and operating condition. Install final permanent type filters only after cleaning of building is completed.

G. Escutcheons - Where pipes pass through floors, walls and ceilings, provide pressed chrome-plated brass or steel plats securely fastened in place.

1.15 EXCAVATION, TRENCHING & BACKFILLING

A. Excavating - Insure that walls and footings and adjacent loadbearing soils are not disturbed in any way, except where lines must cross under a footing. Where a line must pass under a footing, make crossing with the smallest possible trench to accommodate the pipe. Keep excavation free from water by pumping if necessary. Dig trenches true to line and with a flat, even bottom. Form bell-holes to allow proper bedding of the pipe sections. Top of all pipe must be a least 24" below finish grade. Remove and relocate existing obstructions as directed.

B. Pipe Trenches - Made true to grade using string and batter-boards. Place pipe on undisturbed earth where possible; otherwise provide concrete pads or mortar laid masonry piers at all joints and no further than 8' on centers.

C. Shoring, Sub-soil Assumptions and Data, Work Around Trees, Surplus Earth - Refer to Earthwork Section of the specifications.

D. Backfilling - Immediately after testing and inspection, carefully backfill trenches with earth free from clods, brick, etc., to a depth one-half the pipe diameter. Then firmly puddle and tamp as not to disturb the alignment of joints of the pipe. Thereafter, puddle and tamp every vertical foot. Do not place clods, brick, stones, etc., in the trench until the pipe has one foot cover, and not in trenches under the building slab in any case. Backfill within the building and under paved areas shall be performed in accordance with Earthwork Section of the specifications.

E. Broken Pavement - In public streets backfill and repair to satisfaction of authorities having jurisdiction.

1.16 TESTS

A. General - Perform all tests in the presence of the Engineer. Refer to Section 01300 for fuel, water and power required therefore.

B. Water Supply System - Test and secure acceptance of entire system before the piping is insulated or otherwise concealed. Test as follows: disconnect and cap all outlets to plumbing fixtures and all other equipment not designed for the full test pressure; fill the system with water; apply 125 psi hydrostatic pressure and hold for a four hour period with no pressure loss during the entire test period. All piping throughout shall be tight under test. Water piping shall remain under normal water pressure during construction (except when freezing weather is expected.)

C. Drainage and Vent System - Plug all openings, fill entire system with water to point of overflow and hold for at least one hour before inspection. System must remain full during he test without leakage. Each vertical stack with its branches may be tested separately, but any portion tested must have a ten foot head.

D. Fixtures - Test for soundness, stability of support and satisfactory operation.

E. Gas System - Apply 50 psi air test for a four hour period without pressure loss through leakage. Test before equipment, etc., is connected.

1.17 PAINTING

A. Painting and Finishing - Clean and paint with two coats of enamel all unpainted or uncoated ferrous metal parts of mechanical equipment located in machinery rooms, above ceilings, etc. (including uninsulated black steel pipe, uncoated cast iron pipe, hangers, brackets, etc.). Painting of surfaces in finished areas is specified under Section "Painting". Where factory finished items are marred or scratched, replace the item, or upon approval refinish or touch-up as required to bring to a like-new condition.

B. Refinish equipment damaged during construction to new condition.

C. Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.

D. Paint un-insulated duct surfaces visible through grilles and registers flat black.

E. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section.

F. Prime and paint all grillage, supports, hangers, hanger rods, etc. located indoors.

G. Other painting is specified in Painting Section, Finishes Division.

1.18 PIPE IDENTIFICATION

A. Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips. Markers shall be equal to Brady, Seton or Brimer.

B. Submit samples of all labels, tags, chains, etc., for approval.

C. Protect all factory identification tags, nameplates, model and serial numbers, etc., during construction and replace if damaged.

D. Label Spacing and Extent:
   1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
   2. Wherever a pipe enters of leaves a room or building.
   3. At change of direction.
   4. At main valves and control valves (not equipment valves).
   5. At manifolds.
   6. On risers, just above and below floors.

1.19 VALVE TAGS

A. Valve tags: 2" X 3" laminated plastic with ½" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.

B. Valve tag colors:

1. Plumbing: Black tags with white numbers.
2. HVAC: White tags with black numbers.
3. Fire Protection: White tags with red numbers.

C. Valve tag locations: At all valves on mains, risers and branches (not equipment service valves).

D. Valve tag numbers: Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building.

1.20 VALVE CHARTS

A. Furnish and install valve charts with aluminum frames and glass covers in all mechanical rooms. Provide charts showing number and locations of all labeled valves, type of service, etc.

1.21 EQUIPMENT IDENTIFICATION

A. Provide 2" X 3" or larger laminated plastic nameplates with ½" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.

B. Provide similar nameplates for motor starers furnished under this section.

C. Secure nameplates with acorn head screws.

D. Colors:
1. Equipment connected to utility power only - black letters on white nameplates.
2. Equipment connected to emergency power - red letters on white nameplates.

PART 2 - PRODUCTS

2.1 SCHEDULED FIXTURES AND MISCELLANEOUS ITEMS

A. Acceptable Manufacturers - Fixtures listed are from American Standard, Symmons, Elkay, Chicago Faucets and Beneke Catalogs. Equal products of Crane, Kohler, Eljer, Just, Olsonite, Church, Sperzel, T & S Brass, Speakman, Zurn, Delaney, McGuire, Engineered Brass Company, Rudd, State, A.O. Smith, or PVI Industries, Inc. will be accepted.

All china and cast iron plumbing fixtures shall be furnished by the same manufacturer. All lavatory and sink faucets shall be furnished by the same manufacturer or as specified. All lavatory and sink drain and supplies shall be furnished by the same manufacturer or as specified.

B. Fixture Trim - Exposed metal parts to be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixtures and equipment.

C. Scheduled Items-

P-1 Handicapped Water Closet: Kohler K-96057 Highcliff Ultra 1.28 GPF vitreous china high efficiency elongated 16-5/8" high toilet with 1013092 bolt cap accessory pack. Furnish complete with Sloan Flushometer Model 111-1.28 gpf flush valve with synthetic rubber diaphragm, stop/check with locking vandal resistant cap, sweat kit with cast set screw wall flange and ADA compliant handle and Bemis Commercial 1955SSCT white open-front seat with self-sustaining/check hinges and STA-TITE fastening system.

P-2 Water Closet: Kohler K-96053 Wellcomme Ultra 1.28 GPF vitreous china high efficiency elongated toilet with 1013092 bolt cap accessory pack. Furnish complete with Sloan Flushometer Model 111-1.28 gpf flush valve with synthetic rubber diaphragm, stop/check with locking vandal resistant cap, sweat kit with cast set screw wall flange and ADA compliant handle and Bemis Commercial 1955SSCT white open-front seat with self-sustaining/check hinges and STA-TITE fastening system.

P-3 Handicapped Lavatory: Kohler K-2032 Greenwich 20-3/4" x 18-1/4" centerset, vitreous china, wall mounted lavatory with Chicago Faucets Model 420-T41E74ABCP TempShield lead free thermostatic faucet with ADA metal lever handle, integral check valves, deck plate and 1.0 gpm vandal resistant laminar flow aerator. Faucet shall be listed to be ASSE 1070 for temperature and pressure protection and NSF Listed-Standard 61, Section 9, Annex G. Furnish complete with McGuire Part No. 8872-BF 1-1/4" P-trap with cleanout and seamless tubular wall bend with chrome plated brass box flange, Part No. 155A 1-1/4" chrome plated brass grid drain and Part No. LFBV2165CC Convertible lavatory supplies with Lead Free convertible loose key quarter turn ball valve stops and chrome plated brass deep bell flanges. Plumbing Contractor shall furnish and install a TRUEBRO, Inc. Lav-Shield ADA factory pre-cut lavatory protective enclosure Model #2018-KO-G with tamper-resistant stainless steel fasteners and wall anchors.

P-4 Lavatory: Kohler K-2030 Greenwich 20-3/4" x 18-1/4" vitreous china, wall mounted lavatory. Furnish complete with Chicago Model 201-AGN8AE36-317AB deck-mounted lead-free manual faucet with 8" rigid/swing gooseneck spout, 1.5 GPM pressure compensating laminar flow outlet and vandal proof 4" wristblade handles and McGuire Part No. 8872-BF 1-1/4" P-trap with cleanout and seamless tubular wall bend with chrome plated brass box flange, Part No. HD155A 1-1/4" chrome plated heavy duty brass grid drain and Part No. LFBV2165CC Convertible lavatory supplies with Lead Free convertible loose key quarter turn ball valve stops and chrome plated brass deep bell flanges. Plumbing Contractor shall furnish and install a water temperature limiting valve equal to Watts Lead-Free Under Sink Guardian Model LFUSG-B-SC-M1. The water temperature limiting valve shall be a thermostatic mixing valve with integral checks, stainless steel strainers, 3/8" compression fittings and satin chrome finish and shall comply with ASSE 1070. Plumbing Contractor shall furnish and install a TRUEBRO, Inc. Lav-Shield ADA factory pre-cut lavatory protective enclosure Model #2018-KO-G with tamper-resistant stainless steel fasteners and wall anchors.

P-5 Three Compartment Sink with Disposal: Elkay Model LGR4322 Lustertone 43" x 22" x 10" 18 gauge Type 304 stainless steel, triple bowl drop-in sink with centered drains, LK290 3-1/2" drain fitting center outlet for triple bowl sinks with offset center drain and LKAV4061 Avado single hole Lead Free, ADA compliant single-lever top mount faucet with 1.5 GPM semi-professional spout. Furnish complete with McGuire two (2) Part

No.151A 1-1/2" drain assemblies with stainless steel strainers, Part No. 8912-BF 1-1/2" x 1-1/2" P-trap and seamless tubular wall bend with chrome plated brass box flange and Part No. LFH2165CCLK-DF Lead-Free heavy lavatory supplies with loose key stops and chrome plated brass deep bell flanges. Plumbing Contractor shall furnish and install a water temperature limiting valve equal to Watts Lead-Free Under Sink Guardian Model LFUSG-B-SC-M1. The water temperature limiting valve shall be a thermostatic mixing valve with integral checks, stainless steel strainers, 3/8" compression fittings and satin chrome finish and shall comply with ASSE 1070. Plumbing contractor shall furnish and install a waste disposer equal to In-Sink-Erator Evolution Cover Control, lock cover/batch feed with SoundSeal and 3-Stage MultiGrind technologies and 3/4 HP, 120 volts, 1 phase motor.

P-6 Two-Compartment Utility Sink: Elkay Model SS82482 Sturdibilt® Stainless Steel 51" x 27-1/2" x 14" Floor Mount Double Compartment Scullery Sink manufactured from 14 gauge 304 Stainless Steel with a Buffed Satin finish, Center drain placement and supported by (4) 16 gauge stainless steel, 1-5/8” O.D. tubular legs with bullet shaped feet. Furnish complete with T&S Brass Model SMPK-8WLN-06 8" stainless steel wall mount mixing faucet, SS quarter-turn Eterna cartridges w/ spring checks, SS lever handles, SS add-on faucet w/ SS 6" swing nozzle, ss compact spring, 24" flexible stainless steel hose, SS 1.15 gpm spray valve, SS 6" wall bracket & SS1/2" NPT female inlets and Model B-3940 rotary waste valve with twist handle, 3" sink opening and 1-1/2" NPT male outlet and McGuire Part No. 8912-BF 1-1/2" x 1-1/2" P-trap and seamless tubular wall bend with chrome plated brass box flange and Part No. LFH2165CCLK-DF Lead-Free heavy lavatory supplies with loose key stops and chrome plated brass deep bell flanges. Plumbing Contractor shall furnish and install a water temperature limiting valve equal to Watts Lead-Free Under Sink Guardian Model LFUSG-B-SC-M1. The water temperature limiting valve shall be a thermostatic mixing valve with integral checks, stainless steel strainers, 3/8" compression fittings and satin chrome finish and shall comply with ASSE 1070.

P-7 Emergency Shower and Eyewash: Stingray Systems Model T3030-ABS wall mounted emergency shower with an integral mixing valve and Model T2530-ABS wall mounted emergency eye/face wash with an integrated mixing valve.

For the emergency shower, the integral valve assembly shall be nickel-plated brass unit with machined 1¼" connections with check valves for hot and cold-water inlet connections. The integral valve assembly shall control outlet temperature over the range of flow and shall be suitable for shower applications in order to comply with the latest ANSI/ISEA Z358.1 requirements. Temperature adjustment shall be vandal resistant. The control mechanism shall employ a liquid-filled thermostatic motor to drive the valve without additional power requirements. The control mechanism shall employ a stainless steel sliding piston control device with reverse seat closure and both fixed and variable cold-water bypass. In the event of interruption of the cold water supply, the control mechanism closes off the hot water port, stopping all flow (POSITIVE HOT WATER SHUTOFF). In the event of interruption of the hot water supply, the control mechanism shall allow cold flow through both the fixed and variable bypass. In the event that the liquid motor fails, the control mechanism closes off the hot water port with the reverse seat and fully opens the internal variable bypass to allow cold-water flow. The shower shall include a First Aid Red ABS showerhead designed to give the user uniform and non-forceful flow over the entire coverage area

at a minimum of 20 gpm at 30psi. A stainless steel pull handle connected to the nickel-plated ball valve accomplishes activation of the shower. The shower shall include a mounting bracket and shall be secured to the wall with appropriate anchors. The shower shall be installed at the correct elevation per the standard, be installed level and be self-draining to hinder bacteria growth. The shower shall also be independently certified to meet the latest ANSI/ISEA Z358.1 requirements and shall come with ANSI compliant signage.

For the emergency eyewash, the eye/face wash shall be manufactured of corrosion resistant materials. The manifold assembly shall be nickelplated brass unit with machined ½" connections with check valves for hot and cold water inlet connections and 1" NPT female drain connection. The unit shall include a centrally located activator with universal ANSI Compliant sign. The integral Emergency Eye/Face Wash Mixing Valve shall control outlet temperature the range of flow and shall comply with the latest ANSI/ISEA Z358.1 requirements. Temperature adjustment shall be vandal resistant. The control mechanism shall employ a liquid-filled thermostatic motor to drive the valve without additional power requirements. The control mechanism shall employ a stainless steel sliding piston control device with reverse seat closure and both fixed and variable cold-water bypass. In the event of interruption of the cold water supply, the control mechanism closes off the hot water port, stopping all flow (POSITIVE HOT WATER SHUTOFF). In the event of interruption of the hot water supply, the control mechanism shall allow cold flow through both the fixed and variable bypass. In the event that the liquid motor fails, the control mechanism closes off the hot water port with the reverse seat and fully opens the internal variable bypass to allow cold-water flow. The bowl assembly shall include a First Aid Red ABS bowl. The spray heads shall be PVC with dust caps and designed to flow at the specified flow rate. The spray heads shall be incorporated into a Quick Switch Eyewash Block that can be easily removed and serviced, allowing the supply piping to be flushed. The Quick Switch Eyewash Block with integral point of use filters shall be a single supply source eyewash unit to ensure symmetrical and equal flow through each spray head. The eye/face wash shall be complete with nickel-plated inlet pipe and epoxy coated wall mount bracket. The eye/face wash shall be installed at the correct elevation per ANSI/ISEA Z358.1, be level and be self-draining to hinder bacteria growth. The eye/face wash shall also be independently certified to meet the latest ANSI/ISEA Z358.1 requirements. As an eye/face wash, this unit will have a regulated flow rate of more than 3 gpm measured at 30 psi.

P-8 Shower: Powers HydroGuard Model e420-T-1-2 thermostatic and pressure balanced shower mixing valve with color coded brass trim, integral checkstops, NPT inlets/outlets and ADA compliant dome lever handle complete with following accessories 141-903B 2.5 GPM chrome plated brass ball joint showerhead with wall bracket and anchor plate. Valve shall meet the performance requirements of ASSE 1016, Type T/P compensating for 50% fluctuation in supply line pressures and compensate for changes in the water supply temperatures. Valve shall be capable of supplying mixed water temperature within 10°F of hot water supply temperature. Furnish and install a Zurn ZN-415-NL-w/"Type S" cast iron floor drain with Neo-Loc type outlet and "Type S" adjustable square nickel bronze strainer and rim.

P-9 Washing Machine Connections Box: Symmons LaundryMate Model LM600AF fire-rated washing machine supply & drain box with 2" drain, 1/4 turn ball valves with integral Size AA water hammer arresters and NSF 61.9, NSF 372, ASSE 1010, ASME A112.18.1/CSA B125.1 Compliant.

P-10 Washer-Extractor Connections: Two (2) Chicago Faucets No. 293-CP, Inside Sill Fitting, wall-mounted, chrome plated. 2-1/4" metal tee handle with square, tapered broach, slow compression rebuildable cartridge, opens and closes 360° for fine adjustment, closes with water pressure, features square, tapered stem, 1/2" NPT female thread inlet, 3/4" male hose thread outlet and slip wall flange.

P-12 Cold Water Connection Box: Symmons IceMate Model IM600A fire rated ice maker connection box with low lead 1/4 turn ball valves with integral Size AA water hammer arresters and NSF 61.9, NSF 372, ASSE 1010, ASME A112.18.1/CSA B125.1 Compliant.

P-13 Ice Machine Connection Box: Acorn Engineering Model 8140-SSLF stainless steel recessed hose box with single temperature cold water Lead-Free supply valve, Lead-Free screwdriver stop and 18 gauge type 304 stainless steel box with wall flange.

P-14 Hose Valve: Potter Roemer Model 4060-C 1-1/2" rough chrome plated angle valve with Fig. 4615-C chrome plated cap with chain and rocker lugs. The hose valve shall be installed in a cabinets equal to Potter Roemer Series 8022-RED semi-recessed, 20 ga. galvannealed steel cabinet with red polyester finish and lever handle/cam latch.

P-15 Bi-Level Electric Water Cooler with Bottle Filling Station: Elkay LZSTL8WSSP enhanced ezH2O® bottle filling station & bi-level ADA cooler refrigerated stainless high capacity lead reduction quick filter change. chilling capacity of 8.0 GPH (gallons per hour) of 50° F drinking water, based on 80° F inlet water and 90° F ambient, per ASHRAE 18 testing. Features shall include antimicrobial, automatic filter status reset, energy savings, filtered, Green Ticker™, hands free, laminar flow, real drain, visual filter monitor, quick filter change. furnished with Flexi-Guard ® safety bubbler. electronic bottle filler sensor with electronic front and side bubbler pushbar activation. Furnish complete with 1-1/4" 17 ga. rough brass P-trap and McGuire Part No. LFBV2-12 lead free straight pattern convertible loose key quarter turn ball valve stop. Unit shall be certified to UL 399. Unit shall be lead-free design which is certified to NSF/ANSI 61 & 372 (lead free) and meets Federal and State low-lead requirements. Equal units by Oasis, Haws and Halsey-Taylor will be acceptable. Cabinet color finish shall be stainless steel. Furnish with LKAPREZL accessory cane apron.

P-16 Gas-Fired Water Heater (60 Gallon- LP Gas): A.O. Smith Cyclone Mxi High Modulating Model BTH-120 Mxi direct vent commercial LP gas-fired tank-type condensing water heater having an input of 120,000 BTUH; a recovery rate of 153 GPH at 90 degrees rise with 98% thermal efficiency; storage tank capacity of 60 gallons; high efficiency pre-mix powered burner, intelligent control system; power direct venting; 5-year extended tank warranty; and ASME relief valve. Hot water recirculating pump shall be equal to Bell & Gossett ecocirc+ 20-18 circulator (Part No. 60B0B1004) with electronically commutated permanent magnet motor (ECM Technology), stainless steel flanged body and having a capacity of 8 GPM at 20 feet of head and 70 Watts, 120 volts, 1 phase motor. Set the pump to maintain a constant temperature in the

domestic hot water system using an external temperature sensor (KYT38, P/N: 104502). Plumber shall furnish and install a water thermal expansion tank equal to Zurn/Wilkins Model XT-8 having a tank volume of 2.1 gallons, coated high grade steel outer shell, FDA approved butyl rubber bladder, air pressure shrader valve and bronze water connection. Gas vent pipe shall be rated for use on ANSI Category III gas appliances and for positive pressure venting. Vent pipe shall be an air-insulated double wall product having stainless steel inner liner and outer jacket. Vent shall be installed in accordance with the manufacturer's installation instructions. Vent shall be equal to heat-fab Saf-T Vent CI Plus system.

2.2 SAND SEPARATOR

Furnish and install a sand separator as indicated on the plan equal to Rockford Model GSS-10 all-welded steel separators for flush-with- grade installation, 250 gallon (33 cu. ft.) static holding capacity below invert of outlet, 4" tapped inlet and outlet, four (4) 2" tapped internal vent connections, easily removable filter screen, removable 3/8" nonskid diamond treadplate cover(s) reinforced for installation in an area subject to vehicular traffic, secured with stainless steel at head screws, extra-heavy leakproof and airtight gasket, OPEX® Shop Coat coating inside, bituminous coating outside.

PART 3 - EXECUTION

3.1 SANITARY WASTE SYSTEMS

A. Scope - Provide a system of soil, waste and vent piping connecting all plumbing fixtures, equipment, etc., to the house sewer, with consolidated vent connections extending through the building roof, all as shown on drawings.

B. Sanitary Drain, Waste and Vent Piping - PVC Schedule 40 solid wall pipe and PVC DWV fittings shall be used in sanitary drain, waste and vent (DWV), sewer drainage systems in non-pressure applications where the operating temperature will not exceed 140° F. Pipe shall be manufactured from virgin rigid PVC (polyvinyl chloride) vinyl compounds with a cell class of 12454 as identified in ASTM D 1784. PVC Schedule 40 pipe shall be Iron Pipe Size (IPS) conforming to ASTM D 1785 and ASTM D 2665. Injection molded PVC DWV fittings shall conform to ASTM D 2665. Fabricated PVC DWV fittings shall conform to ASTM F 1866. All pipe and fittings shall be manufactured in the United States. All systems shall utilize a separate waste and vent system. Pipe and fittings shall conform to NSF International Standard 14. Installation shall comply with the manufacturer's latest installation instructions and shall conform to all applicable plumbing, fire, and building code requirements. Buried pipe shall be installed in accordance with ASTM D 2321 and ASTM F 1668. Solvent cement joints shall be made in a two-step process with primer conforming to ASTM F 656 and solvent cement conforming to ASTM D 2564. The system shall be protected from chemical agents, fire-stopping materials, thread sealant, plasticized-vinyl products or other aggressive chemical agents not compatible with PVC compounds. The system shall be hydrostatically tested after installation.

C. Laying Out Work - Vents from any fixture, when connected to vent line serving other fixtures, shall be executed at least 6 inches above flood level rim of highest of such fixtures to prevent use of vent lines as a waste. Make changes in direction by appropriate use of 45 degree Y-s, 1/2 Y's, or long sweep 1/4, 1/6, 1/8, or 1/16 bends.

Sanitary T's or short 1/4 bends may be used on vertical stacks or drainage lines where change in direction of flow is from horizontal to vertical; except that long-turn TY's shall be used when two fixtures are installed back to back with common drain. Straight T's, Ells, and Crosses may be used on vent lines. Make no change in direction of flow greater than 90 degrees. Where different sizes of drainage pipes or fittings are connected, use standard increasers and reducers of proper size. Do not reduce size of drainage piping in direction of flow. Drilling and tapping of house drains, soil, waste or vent pipes, and use of saddle hubs and bands are prohibited. Do not begin work until elevation of final connection point is verified and grading of entire system can be determined.

D. Grading - Uniform and not less than 1/8" per foot for pipe 4" and over, and not less than 1/4" per foot for 2" and 3" piping.

E. Hangers - Support pipe adjacent to each fitting and on centers as indicated in 2018 IPC TABLE 308.5 HANGER SPACING with hangers as specified hereinafter. Rigidly support base of vertical runs with solid masonry or concrete. In addition, provide adequate sway bracing to stabilize all components of the system. Provide special support for fixture arms, closet bends, etc.

F. Test Fittings - Not shown on the drawings; provide where required for partial tests.

3.2 DRAINAGE SPECIALTIES

A. Equivalent Products - Specialties by Josam, Zurn, Wade or J.R. Smith and approved as equal to those specified may be used.

B. Cleanouts - Provide in cast iron sanitary piping at all changes in direction greater than 45 degrees, at ends of branches, at intervals not exceeding 100 feet on straight runs, and elsewhere as shown. Where more than one change of direction occurs in a run of piping, only one cleanout shall be required for each 40 feet. Cleanouts shall be full opening type, completely accessible. Size same as lines in which they occur, but not larger than 4 inches. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with lead seals.

Catalog numbers from Zurn.

In Hard Tile Floors - ZN-1400-BP-T, adjustable, cast iron body with bronze plug and satin finished square scoriated nickel bronze top.

In Soft Tile Floors - ZN-1400-BP-TX, adjustable, cast iron body with bronze plug and recessed square nickel bronze cover.

In Carpeted Floors - ZN-1400-BP-CM, adjustable, cast iron body with bronze plug and carpet marker cover.

In Concrete Floors - Z-1400-BP-HD, adjustable, cast iron body with bronze plug, round loose-set scoriated heavy duty cover.

In Outside Lines - Z-1402-BP cast iron body, round scoriated cover and frame with bronze plug. Terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In Finished Walls - Z-1446-BP cast iron cleanout tee with bronze plug and stainless steel wall plate cover. Where distance from plug to finish wall will exceed 4" provide Z-1446-BP-A extended over from sanitary tee to bring plug within 4".

C. Floor Drains - Size outlets same as pipe to which the connect. Install temporary closures during construction. Each drain to have cast iron P-trap. Provide types as scheduled below.

Typical Floor Drains (F.D.) - Zurn ZN-415-NL-w/"Type S"-P cast iron drains with Neo-Loc type outlet, trap primer connection and "Type S" adjustable square nickel bronze strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6", for 4" drains 8" x 8". Furnish and install in each drain a Zurn Z1072 Zshield barrier waterless trap seal device complying with the performance requirements of ASSE 1072 standard and third party listed with IAPMO, ICC and ASSE.

Floor Sink (F.S.) - Zurn ZN-1910-1-LD 8" x 8" x 6" cast iron square floor sink with A.R.E. interior, less dome strainer and less grate.

Mechanical Room Floor Drain (M.R.F.D.) - Zurn Z-541-NL 12" diameter cast iron drain with Neo-Loc outlet, sediment bucket and cast iron grate. Furnish and install in each drain a Zurn Z1072 Zshield barrier waterless trap seal device complying with the performance requirements of ASSE 1072 standard and third party listed with IAPMO, ICC and ASSE.

Trench Drain in Apparatus Bay - Zurn Z886-CBF 6-3/4" wide reveal trench drain system with black acid powder coated heavy-duty frame. Modular channel sections are made of 0% water absorbent High Density Polyethylene (HDPE). Channels have a positive mechanical connection between channel sections that will not separate during the installation and mechanically lock into the concrete surround every 10 inches. Ductile Iron Slotted Grate shall conform to ASTM specification A536-84, Grade 80-55-06. Grate lockdown bars shall be integral to the frame.

3.3 WATER PIPING

A. Scope - Connect to or coordinate with the local utility board the connection to the water main as indicated and extend to all plumbing fixtures, hose bibbs, water, etc.; as indicated or required. The Reduction of Lead in Drinking Water Act (42 USC 300G) requires that any valve, fitting, or fixture coming in contact with potable water (used for drinking or cooking) must meet the requirement of having weighted average lead content of less than 0.25 percent.

B. General Workmanship - Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all openings, finished ceilings, etc. Route through previously built in sleeves and avoid cutting or other weakening of the structure. Ream all pipe to remove burrs. Make changes in direction and size with fittings. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to insure unrestricted flow, eliminate air pockets, and to permit complete drainage of the systems.

Install all buried piping with at least 24" of earth cover.

C. Piping - Typical lines to be of copper tubing meeting ASTM B-88; Type "L" hard above ground and Type "K" soft below ground. Fittings shall be lead-free wrot copper fittings made from commercially pure copper mill products per ASTM B 75 Alloy C12200 or lead-free cast dezincification-resistant (DZR) fittings made of high quality lead-free performance bronze alloy per ASTM B 584 Alloy C87850 or C87600. Fittings shall be third party certified to Annex G of NSF/ANSI 61. Make up joints with sweat fittings, and lead-free solder; clean surfaces with steel wool or emery cloth before applying. Do not make joints or branch connections below a slab on grade. All piping, solder and flux shall be lead-free.

   In lieu of sweat fittings, lead-free copper and copper alloy press fittings may be used. Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Copper press fitting joints shall be made in accordance with the manufacturer's installation instructions. The tubing shall be fully inserted into the fitting and the tubing marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the tubing to assure the tubing is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool approved by the manufacturer.

D. Nipples - Of same material as pipe in which they are installed; provide extra strong when unthreaded portion is less than 1" long.

E. Water Hammer Arrestors - Where any quick-closing valves is installed, a lead-free water hammer arrestor shall be installed. Water hammer arrestors shall be installed in accordance with the manufacturer's specifications and shall conform to ASSE 1010.

F. Grading - Grade pipe upward from source to facilitate drainage and air relief. Where low points are required because of long runs or where sections may be valved off, provide with 3/4" globe valve and hose nipple for drainage at low point. Make all connections to risers and fixtures from top of mains.

G. Sterilization - The completed supply line shall be sterilize in accordance with AWWA Technical Report entitled "DISINFECTING BUILDING POTABLE WATER PLUMBING IN NEW OR REPAIRED SYSTEMS NOVEMBER 2024" and as required by the State Board of Health. Local Health Department approval must be obtained before the system is put into service. The complete copper hot and cold water distribution system shall be disinfected prior to being placed in service.

3.4 WATER PIPING SPECIALTIES

A. General - The Reduction of Lead in Drinking Water Act (42 USC 300G) requires that any valve, fitting, or fixture coming in contact with potable water (used for drinking or cooking) must meet the requirement of having weighted average lead content of less than 0.25%.

B. Hot Water Balancing Valve - Furnish and install CircuitSolver® union assembly with strainer as indicated on the plans. CircuitSolver® union assembly with strainer shall be self-contained and fully automatic without additional piping or control mechanisms. Thermostatic valve shall be a CIRCUITSOLVER® as manufactured by ThermOmegaTech®, Inc., or equivalent.

CircuitSolver® shall regulate the flow of recirculated domestic hot water based on water temperature entering the CircuitSolver® union assembly with strainer regardless of system operating pressure. As the water temperature increases the valve proportionally closes dynamically adjusting flow to meet the specified temperature.

1. CircuitSolver® never fully closes, even at the desired set point. There is always sufficient bypass flow back to the recirculating pump to prevent overheating or “dead heading”.
2. CircuitSolver® is set at the factory for the desired return temperature. No field adjustments needed. Several temperature set points are available.
3. Thermal actuator shall be spring-loaded and self-cleaning, delivering closing thrust sufficient to keep orifice opening free of scale deposits.

All components in the CircuitSolver® union assembly with strainer are made with lead-free materials. The major components that make up the CircuitSolver® are constructed of type 300 series SS. CircuitSolver® union assembly with strainer shall be rated to 200 PSIG maximum working pressure and shall be rated to 250°F (121.1°C) maximum working temperature. CircuitSolver® union assembly with strainer shall be NSF/ANSI/CAN 61 & 372 certified for use in domestic water systems.

Installation of CircuitSolver® union assembly with strainer shall be made by qualified tradesmen. Install CircuitSolver® union assembly with strainer in each domestic hot water return piping branch beyond last hot water device in that branch.

A. Strainer is integrated in the valve assembly.
B. Provide suitable access panel as required in non-accessible ceilings and walls.
C. Pay close attention to flow arrow, especially with valves that have an integrated check valve.

C. Unions - Lead-Free cast DZR brass, 150 lb. rated, ground-joint type in copper pipe. Provide in all sizes of threaded pipe, and in sweat jointed pipe over 1", so as to facilitate easy repairs. In such lines install adjacent to water heaters pumps, tanks, etc., into which piping is terminated; and on at least one side of valves, cocks, strainers, etc., and other devices which occur in piping runs. Provide dielectric unions between ferrous and non-ferrous piping (including piping and water heater stubs where different).

D. Valves - Provide where shown and/or specified, including all fixtures or equipment not furnished with stops. Valves shall be lead-free made of high quality lead-free silicon Performance Bronze alloy and shall be third party certified to NSF/ANSI 61-G and/or NSF-ANSI 372.

All valves of each type shall be the product of one manufacturer, Nibco units as indicated below, or equals by Milwaukee, Stockham, Crane, Jenkins or Walworth. All valves shall be rated 200 lb. WWP.

Lead-Free Gate Valves: 2" and smaller - #S-113-LF bronze solder-joint type; #T-113-LF for threaded pipe.

Lead-Free Ball Valves: Contractor may use lead-free three piece ball valves in all locations in lieu of gate valves as shown on the plans. 2-1/2" and smaller - #S-595-Y-LF lead-free bronze full port solder-joint type three piece ball valve - #T-595-Y-LF for threaded pipe.

Lead-Free Check Valves: 2" and smaller - #S-413-Y-LF for solder joint type and #T-413-Y-LF for threaded pipe. 2-1/2" to 10" pipe - #F-960-LF lead-free Class 250 lb iron body silent check valve.

Lead-Free Butterfly Valves: 2-1/2" and larger - #LD-2000 lug style 200 PSI, ductile iron body, extended neck, molded-in seat liner, lever-lock handle certified lead-free gate valve.

E. Strainers - For 2" and smaller, Lead-Free brass body and cap, wye-pattern strainer with #20 mesh, 304 stainless steel basket - Watts Series LF777SI (threaded ends) or LFS777SI (solder ends). For over 2", Lead-Free flanged, wye-pattern, ductile iron strainer with 304 stainless steel perforated screen basket - Watts Series 77F-DI-250.

F. Backflow Preventer - Lead-Free backflow preventer with quarter turn ball valves and strainer for 2" and smaller - Watts Model LF909M1QT-S with No. 909-AG air gap and for 2-1/2" and larger - Watts Model LF909QT-FDA-S-FDA with No. 909-AG air gap.

G. Pressure Reducing Valve - Watts, Bell & Gossett, Foster or Spence, with pressure range suitable for the system.

H. Wall Hydrants (Typical) - Zurn Model Z-1321XL exposed, non-freeze, anti-siphon, automatic draining, Lead Free Ecolotrol 3/4" wall hydrant with loose key, stainless steel face and 90° inlet elbow with union nut; or similar products by Wade, Jay R. Smith or Josam. Furnish vacuum breaker on each hydrant. Install approximately 18" above finished grade.

3.5 PIPE HANGERS AND SUPPORTS

A. Spacing - Install supports as required to prevent sags bends or vibration; in any case provide within 6 inches of elbows and valves, at ends of branches over 5 feet, and on centers not exceeding the following:

PVC -	4 feet; maximum
copper tubing -	up to 1", 6 feet; over 1", 8 feet
steel pipe -	up to 1-1/4", 8 feet; 1-1/2" and 2", 10 feet; 2" through 3-1/2", 12 feet; over 3-1/2", 16 feet

B. Equal Products - Equivalent devices by Grinnell, Elsen, Stockham, or Crane will be accepted.

C. Hanger Rods - Of mild steel, threaded as required. Use not smaller than 3/8" rods for pipe 2" and under, 1/2" rods for pipes 2-1/2" through 6" but generally as standard for the hanger selected. Support rods with threaded inserts, expansion shields, or beam clamps.

D. At Typical Suspended Horizontal Pipe - Adjustable clevis or split-ring type, equal to Fee & Mason 239 or 215.

E. Where in Contact with copper Pipe - Same as above except hangers copper plated.

F. Vertical Piping Along Wall - Fee & Mason #241 riser clamps at floors and #336 stand-off brackets toggle bolted to wall. Place under hubs or couplings where at all possible.

G. On Insulated Lines - Size hanger loops to fit over insulation, and provide 12" long, 22 ga. galv. sheet metal half-round saddles to protect insulation.

H. Supports for Water Supply Piping in Spaces Behind Plumbing Fixtures - ABS brackets and U-bolts. Secure the 2-piece brackets to cast iron stacks. U-bolts shall be sized to bear on the pipe. Brackets shall be P & M Bracket co. or equal.

I. At Horizontal Piping Along Wall - Fee & Mason #146 J-hooks.

3.6 PIPE INSULATION

A. Scope - All water piping, and excluding plated brass fixture connections shall be insulated as specified herein.

B. Insulation - 1" thick snap-on glass fiber insulation having a minimum density of 5 lbs/cu. ft. and a maximum thermal conductivity of 0.25 BTU/(hr)(sq. ft.)(° F/in.) at 75° F mean temperature, Gustin-Bacon Snap-On with Universal kraft-foil laminated jacket, or equivalent by Owens-Corning or JM.

C. Application - Apply insulation to the dry piping. Seal jacket with self-sealing lap and staple with outward clinching staples 3" O.C. Butt adjoining sections of insulation tightly and seal with self-adhering butt joint strips.

D. Fittings - Cover fittings with factory pre-molded fitting covers of the same thickness as the adjacent insulation. Insulate flanged valve bodies and flanged unions. Do not insulate screwed unions in hot water piping. Finish concealed fittings with a skim-coat of insulating cement. When cement is dry, fitting shall be covered with glass fab and vinyl acrylic mastic. If necessary fire and smoke ratings are met, Zeston type fittings covers may be used on concealed fittings. Where exposed in equipment rooms, boiler rooms and finished spaces, fittings shall be finished vinyl acrylic mastic over glass fab. Where exposed to the weather, fittings shall be insulated with Fiberglass pipe covering mitered to fit snugly, or hydraulic setting mineral wool cement of the same thickness as the pipe covering, finished with 1/16" thick mineral stabilized asphalt weather-proofing compound.

   At the contractor’s option, concealed tees may be insulated with field fabricated tee covers. The straight run pipe covering shall be cut around the branch piping and pipe covering on the branch line shall be notched and contoured to snugly fit the main line covering. Apply glass fab around the main line lapping the contoured branch line joint by 1" minimum for the full 360° of the joint. Cover the covering of the entire fitting with 1/8" thick (dry) coat of vinyl acrylic mastic over glass fab.

E. At Walls and Floors - Extend insulation through structural members (size sleeves accordingly).

F. Electric Water Cooler - Insulate drain connections and traps with 1/8" thick insulating tape by Presstite Engineering Company, St. Louis, Missouri.

G. At Hangers - Protect covering with 10" long section of 22 ga. galv. steel formed in a half circle to fit the insulation.

H. Handicapped Lavatories - Handicapped lavatory P-traps and angle stop assemblies (including the supply riser) shall be insulated with Trap Wrap Protective Kit Series 500 by Brocar or equal.

3.7 FIXTURE SUPPORTS AND CONNECTIONS

A. General - All fixtures including lavatories, urinals, water closets, electric water coolers, etc., must be securely fastened to the walls or floor.

B. Lavatory Carrier - Where a plumbing chase is shown behind the lavatory, the contractor shall furnish and install a carrier compatible with the specified lavatory and equal to Zurn Series Z-1231 concealed arm system or equal by Josam, Wade, or J.R. Smith.

C. Urinal Carrier - Where a plumbing chase is shown behind the urinal, the contractor shall furnish and install a urinal carrier compatible with the specified lavatory and equal to Zurn Series Z-1222 plate type system or equal by Josam, Wade, or J.R. Smith.

D. Wall Mounted Fixtures - Support all wall mounted fixtures with Zurn Series Z-1259-SP wall supported plate system.

Where fixtures are back to back on a solid wall, mount with Zurn Series Z-1259-D back to back wall supported plate system. Do not use toggle bolts or expansion bolts except as noted.

Where fixtures are mounted on solid (single wythe) walls finished both sides, install the Zurn fixture support front plate with plated toggle bolts.

Where fixtures are mounted on wood or light gauge steel studs, employ, in addition to the Zurn fixture support plate, pressure treated blocking of 2 x 10 nominal size well secured into stud line with non-corrosive fasteners. Fit behind stud flanges, using especially placed studs as required.

C. Floor Connections - Provide cast iron floor flanges caulked to drainage pipe. Bolt the connection and make tight to fixture with setting ring or polyethylene gasket flange.

D. Water Supply Connections - Provide brass nipple or copper pipe from water riser to fixture stop valve. (Steel pipe will not be approved.) Exposed portion of nipple shall be chromium plated.

E. Waste Arms to Fixtures - As specified hereinbefore. Where copper or brass pipe is specified, all joints downstream from trap shall have soldered joints.

F. Handicapped Fixtures - All handicapped plumbing fixtures shall be installed in accordance with the Georgia Accessibility Code. In compliance with Georgia Accessibility Code, flush controls for handicapped water closets shall be mounted on the wide side of the toilet stall area.

3.8 LP GAS DISTRIBUTION SYSTEM

A. Scope - Make house supply connection, furnish and install regulators as indicated and extend all gas fired equipment as well as other locations shown.

B. Utility Connection - All work shall be done in strict accordance with local LP gas supplier regulations.

C. Installation Generally - In accordance with local gas code, requirements of local utility company, and NFPA Standard #54. Cut pipe accurately to measurement established at site and work into place without springing or forcing. Avoid runs through solid walls or floors. Route through previously built-in sleeves and avoid excessive cutting or other weakening of the structure. Ream all pipe to remove burrs. Make changes in direction and size with fittings. Make take-offs from top or sides of mains, not from bottoms. Cap or plug open pipe ends during installation to keep out foreign material. Lay out and grade work (1/4" in 15' min.) to avoid trapped lines; where unavoidable provide a 4" drip leg with removable cap at low point. Use joint compound sparingly, applying to make threads only.

D. Pipe - Above Grade and Inside of the Building - Pipe shall be schedule 40 black steel meeting ASTM A53. Nipples shall shall be meet ASTM A733. For piping 2-1/2" and smaller, fittings may be threaded, malleable iron meeting ANSI B16.3 or socket welded meeting ANSI B16.11. For piping 3" and larger, fittings shall be schedule 40 steel welded as follows:
   Up to 4-inch, ANSI B16.11, Socket welded.
   Over 4-inch, ANSI B16.9, Butt welded.

E. Welded Joints - Fusion weld in accordance with the recommendation of AWS. Make changes in direction and intersections of line with welding fittings. Mitering of pipe to form elbows, notching straight runs to form tees, or any similar construction will not be permitted. Welders to be AWS certified.

F. Connections - Cock shall be Rockwell, 2" and smaller shall be 125 lb. SWP bronze cocks, screwed. Cocks 2-1/2" and larger shall be 200 lb. SWP iron body lubricated plug cocks, flanged.

G. Cathodic Protection - Provide anode riser with transition fitting at each location the underground plastic piping rises above grade.

H. LP Gas Pressure Regulators - Standard service-type gas regulators meeting job and local Gas Company requirements, with automatic safety shut-off valves, shall be similar to Security Corp. Model IPS-L and IPS-H. See plans for inlet and outlet pressures and capacities.

END OF SECTION 220100

DIVISION 23 - MECHANICAL
SECTION 230100 - HEATING, VENTILATION AND AIR CONDITIONING

PART 1 - GENERAL

1.1 SCOPE

A. The General Conditions of these Specifications are applicable in full hereto.

B. Include all equipment, material, and labor required for complete and satisfactory operation of Heating, Ventilation and Air Conditioning Systems, even though every item involved is not indicated.

1.2 WORK INCLUDED

A. Furnish and install energy recovery ventilator unit as indicated and scheduled on the plans.

B. Heating and Air Conditioning systems consisting of split system heat pump units as shown on the plans. Complete air distributions systems as shown on plans.

C. Heating and Air Conditioning system consisting of ductless split system heat pump units as shown on the plans.

D. Heating systems consisting of gas-fired radiant heaters.

E. Ventilation of the restrooms, janitor closets, and general ventilation.

1.3 LAWS AND CODES

A. The Installer will install all work in strict compliance with the 2018 International Mechanical Code with Georgia Amendments, 2015 International Energy Conservation Code with Georgia Amendments and be inclusive of all State, County, City and N.F.P.A. laws and regulations. Where conflicts occur between a code and contract drawings or specifications, most stringent requirements shall apply.

B. The Installer will obtain and pay for all permits, fees and charges required incidental to the work involved that may be necessary for fully completing the work.

C. The Installer will make all necessary tests required by local authorities, legal regulations and/or the Engineer and return to the Engineer any certificate of approval issued in this district for all Mechanical work signed by the Inspecting Administrative Authority in charge of each particular part of the work.

1.4 QUALIFICATIONS OF SUB-CONTRACTOR

Must be properly State licensed and established as a Heating and Air Conditioning Contractor at location of the work, maintaining locally adequate service facilities and having experience in the satisfactory installation of three systems of this type and size.

1.5 WARRANTY

Guarantee in writing to make good without cost any defects in materials and workmanship within one (1) year from the date of acceptance of the project. In addition guarantee air conditioning unit compressors for a five (5) year period.

1.6 DRAWINGS

In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural and electrical drawings, and lay out work so as to fit within ceiling grids, lighting and other parts. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

1.7 CHANGES AND CONFLICTS

If during construction desirable or necessary changes become apparent, advise the Architect and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.8 SUBMITTAL DATA

A. Within 25 days after award of contract, submit for approval a complete schedule of material and equipment proposed including catalog data, scheduled capacities, fan curves, etc. Partial lists will not be considered.

B. Submit 1/2" scale shop drawings of all equipment rooms containing air handling units showing proposed arrangement of equipment, ductwork, piping, floor drains, power requirements and controls. Submit detail layouts of potential conflicts at plumbing drops, equipment rooms, tight ceilings, etc. Shop drawings of equipment rooms shall include section cuts and elevation views of the proposed installations. In addition to equipment shop drawings, submit fabrication shop drawings of the entire duct system(s) identifying types of seams and joints to be utilized, method(s) of identification of duct sections and fittings, metal gauges of duct sections and fittings, and type(s) of duct hanger to be used. Failure to submit shop drawings will make the contractor responsible for changes required to facilitate installation of all systems.

1.9 EXISTING CONDITIONS

Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged misunderstanding regarding utility connections, permits, fees, etc.

1.10 PHASING

Interrupt existing services only at times approved by the Owner. Hold interruptions to the minimum in duration and frequency.

1.11 FIELD INSTRUCTIONS

Provide training to Owner in the proper operation of all equipment.

1.12 CHARGES, GREASE, FILTERS, ETC.

Furnish first charges of refrigerant, grease, oils, etc., and be responsible for such full charges for the guarantee period, except when loss is due to negligence of Owner. Provide complete filter changes during guarantee period. Make last service call two weeks prior to year end inspection and include lubrication of all motors, bearings, etc., calibration and adjustment of all controls, and new filters.

1.13 BOUND AND FRAMED INSTRUCTIONS

A. Furnish 3 complete sets of operating and maintenance instruction, bound in hard cover, indexed and tabbed. Include wiring and control diagrams with explanatory data; control sequence describing start-up, operation and shutdown; operating and maintenance instructions for each piece of equipment; manufacturer's bulletins and catalog data; parts list and recommended spare parts. Fold in large sheets of drawings.

B. Provide photostat of system control and wiring diagrams, condensed operating instructions, and lubricating schedule; all components shall be numbered and identified on diagram. Submit for approval; after approval, frame under glass or plastic and mount on main equipment room wall where directed.

1.14 COORDINATION OF WORK WITH OTHER TRADES

A. Electrical Work -

1. General - **No piping or ductwork shall be installed over an electrical panel**.
2. Power - All power wiring required for installation of equipment is specified under Electrical Division.
3. Controls - HVAC contractor shall furnish and install all controls, and control and interlock wiring, as specified or required to properly complete the installation. Control conduit is specified under Electrical Division to the extent shown on electrical drawings; all other control conduit shall be provided under this Section. All electrical work performed under this Section shall conform to requirements set forth in the Electrical Division.
4. Wiring Diagrams - Furnish to the Electrical Contractor for the specific makes and models of electric-motor operated equipment to be installed.
5. Motor Starters - To be furnished under this Section; installation thereof is specified under Electrical Division, except for those which are specified to be factory assembled or combination disconnect/motor starter. Provide for each motor or group of motors requiring a single control (and not controlled from a motor-control center), a suitable controller and device that will function as specified for the respective motors. Provide overload protection for each ungrounded conductor to each motor 1/8 HP or larger (manual reset type unless indicated otherwise). The overload-protection device shall be integral with the motor or controller. Unless indicated otherwise, furnish pilot lights with all remote starters. Where auxiliary control devices are connected into control circuit, these devices shall not bypass safety controls (motor-overload protective devices, high pressure cutouts, low pressure cutouts, etc.).

6. Modifications - The cost of any modifications of the electrical power wiring conduit required by heating, air conditioning or ventilation equipment or controls having electrical power requirements differing from that shown on the drawings and/or specified, shall be the responsibility of the Mechanical Contractor.

B. Foundations - Mechanical contractor shall provide foundations, supports, etc., not specified under other Divisions and as required to mount equipment in a workmanlike and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work.

C. Access panels and doors - Furnish to general contractor for installation wherever required for access to valve, damper, air vent or similar device. Doors shall be suitable for wall finish involved, 12" x 16" unless otherwise indicated, fire rated where fire walls are penetrated, Milcor, Philip Carey, Zurn or other approved equal. Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 7/8" diameter color coded equipment locator tack as manufactured by Marking Services, Inc. or a 1/2" diameter color coded self-adhesive individual marker dot as manufactured by EMED Co., Inc., with appropriate color as specified under Pipe Identification and Color Coding.

D. Roof Flashing - Metal roof flashings, flashings around pipes and other related roofing work are specified under Roofing Section (but with reservation that Roofer be advised of requirements and furnished items to be installed before roofing is in place). Flashing cones, counter flashing hoods, storm collars, etc., are to be provided by mechanical contractor. All roof flashings, stacks, etc., shall be painted to match the roof. **All roof flashings shall be compatible with the roof system. Contractor shall coordinate with roof system requirements.**

E. Pipe Sleeves - Fit all pipes passing through masonry and job cast concrete (except slabs on grade) construction with sleeves. Sleeves shall be cut flush with each surface, 1/2" larger in diameter than the passing pipe or cover, built-in as work progresses. Sleeves thru joists and beams shall be of galvanized steel pipe; other sleeves shall be of 16 ga. galv. iron. Make space between floor sleeves and passing pipes watertight by caulking with fireproof rope packing and plastic waterproof caulking compound. Where copper pipe passes thru a slab on grade, provide a 24" long plastic pipe sleeve.

F. Service Connections - Provide final piping and electrical connections for all equipment that is not connected under the Plumbing and/or Electrical Sections.

G. Cutting and Patching - Openings are to be laid out and built-in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected. Otherwise walls, etc., affected must be reworked by trade which erected same at expense of Mechanical Contractor; chasing and cutting of new work will not be acceptable. Openings in existing walls shall be made by trade requiring same, with repairing and patching required thereby done by the respective trade whose work is damaged.

1.15 MISCELLANEOUS REQUIREMENTS

A. Materials and Equipment - New and of best quality in every respect. Pipe and fittings shall conform to the ASTM Standard designated for pipe of each material.

Equipment shall be essentially the standard product of the manufacturer and UL approved. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of each unit need not be.

B. Workmanship - First class and in accordance with best practice. Pipe shall be cut clean, properly reamed, threaded or soldered, erected plumb and secure. Make changes in pipe size with reducing fittings without the use of bushings. Work shall be executed by experienced mechanics and shall present a neat appearance. Install equipment in accordance with manufacturer's recommendations.

   At all stages of installation, protect pipe openings, fixtures, duct work, and equipment against the entrance of foreign materials, and from damage by the elements, mortar, paint, etc.

C. Factory Finishes - Manufacturer's standard unless otherwise stated. Submit color cards for selection where choice exists.

D. Expansion - Provide for expansion and contraction of all piping and make proper provisions so that excessive strain will not occur on piping or other parts.

E. Protection and Cleaning - Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Architect. Damaged or defective items in the opinion of the Architect or Engineer shall be replaced. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe and duct openings with caps, plugs or sealing materials during fabrication and installation. Tightly cover and protect grilles, fixtures and equipment against dirt, water chemical, or mechanical injury.

   At completion of all work thoroughly clean grilles, fixtures, exposed materials and equipment. Upon completion of work, clear all drains, traps, fixtures, ducts and pipe. Adjust all valves, pack stuffing boxes, remove rubbish and leave work in clean and operating condition. Install final type filters only after cleaning of building is completed.

F. Escutcheons - Where pipes pass through floors, walls and ceilings, provide pressed chrome-plated brass or steel plates securely fastened in place.

G. Safety Provisions - Provide covers or guards on all hot, moving and projecting items which would be hazard to occupants of the building or to service personnel.

1.16 PLUMBING WORK

A. Floor Drains - By Plumbing Contractor. HAC Contractor shall provide all air conditioning equipment drains, relief valves, pump bases, air vents, etc., to the floor drains.

B. Water - Valved supplies to within two (2) feet of equipment is specified under Plumbing Section. Final connections to equipment by HAC Contractor, with work meeting requirements established in Plumbing Section.

1.17 VIBRATION AND NOISE CONTROL

A. General - Eliminate transmission of perceptible vibration, structure-borne noise, or objectionable air-borne noise to occupied area by HVAC equipment. The Contractor shall be responsible for all isolation and engage the services of an isolation supplier to furnish all isolation.

B. Isolation Supplier Qualifications - The supplier must be a firm or individual capable of dealing effectively with vibration and noise characteristics, effects and criteria and have facilities and capabilities for measuring and evaluating such disturbances and the preparation of drawings and installation instructions. Submit for approval, data showing disturbing frequencies, supported weight, static deflection or natural frequency and efficiency for each isolator and damper proposed for use. All isolation components shall be the product of a single manufacturer, Amber-Booth, Consolidated Kinetics, Korfund Dynamics, Mason Industries, or approved equal.

C. Isolation Supplier Responsibilities - All isolation material selections are to be based on laboratory, published or factory certified data, proving that such materials and usage comply with these specifications. After installation, the isolation supplier in company with the Contractor and the Architect, shall inspect all isolation materials furnished by him, and submit a written report noting any discrepancies found. Should any objectionable noise or vibration be detected, determine the source, cause and path of such disturbance and correct all deficiencies. Concrete foundations associated with isolators or isolation material are to be sized by the isolation supplier, considering the structural and physical limitations of the space. Shop drawings shall show size and location of anchor bolts for isolators and equipment thereon.

D Equipment Isolators - Isolators shall be factory furnished, having static deflection as required to provide 95% isolation efficiency. Isolators for floor mounted equipment shall be laterally stable, spring type with steel base plates, ribbed neoprene acoustical pads and leveling bolts. Isolators for suspended equipment shall be combination steel spring and rubber-in-shear hangers equal to VMC Series RSH. Provide spring type pipe hangers as required to isolate pipe vibration from the building.

E. Pipe Flexible Connectors - Flexible connections in water lines shall be single sphere molded neoprene and nylon connectors equal to Mason type "MFNC", rated for 150 psig at 250 F. Flanges shall be ductile steel floating type drilled to ANSI-150 standards. Control rods shall be furnished.

F. Sound Levels - Sound levels caused by operation of pumps, fans, air handling systems, etc., whether generated within rooms or transmitted to rooms through ducts, walls or floors, pipes, etc., shall not exceed specified NC rating at any point within room not more than 6 feet from an air outlet in accordance with ASHRAE octave band method. Offices, conference rooms, classrooms, and similar spaces shall have maximum NC-32; corridors, and lobbies, NC-40; toilets, NC-45.

1.18 PAINTING

A. Painting and Finishing - Clean and paint with two coats of enamel all unpainted or uncoated ferrous metal parts of mechanical equipment located in machinery rooms, above ceilings, etc. (including uninsulated black steel pipe, uncoated cast iron pipe, hangers, etc.).

Painting of surfaces in finished areas is specified under Section "Painting". Where factory finished items are marred or scratched, replace the item, or upon approval refinish or touch-up as required to bring to a like-new condition. Refinish equipment damaged during construction to new condition.

B. Non-Potable Water - Paint all non-potable water pipe and insulation yellow in accordance with Plumbing Code using paint of type specified in Painting Section.

C. Miscellaneous Paint Requirements - Paint un-insulated duct surfaces visible through grilles and registers flat black. Prime and paint all bare, exposed, exterior piping using type specified in Painting Section. Prime and paint all grillage, supports, hangers, hanger rods, etc. located indoors. Other painting is specified in Painting Section, Finishes Division.

1.19 PIPE IDENTIFICATION

A. General - Identify all piping exposed to view or accessible through removable ceilings or access panels with plastic snap-on pipe line markers. Color code markers in accordance with ANSI A13.1. Show pipe contents and direction of flow. Markers on lines 8" OD and smaller shall be taped in place; on lines over 8" OD secure with spring clips. Markers shall be equal to Brady, Seton or Brimer.

B. Submittal - Submit samples of all labels, tags, chains, etc., for approval.

C. Factory Equipment Labels - Protect all factory identification tags, nameplates, model and serial numbers, etc., during construction and replace if damaged.

D. Label Spacing and Extent -
1. On straight run of pipes: Above suspended ceilings space labels approximately 10 feet on center; elsewhere, 20 feet on center.
2. Wherever a pipe enters of leaves a room or building.
3. At change of direction.
4. At main valves and control valves (not equipment valves).
5. At manifolds.
6. On risers, just above and below floors.
7. All natural gas piping in the 2 psig system: label at the beginning, at all gas cocks, at ends and at 6'-0" intervals with labels reading “2 psig”.

1.20 VALVE TAGS

A. General - Valve tags shall be 2" x 3" laminated plastic with ½" numbers engraved at top, leaving space for further engraving by others. Secure tags with chains to valve yoke or stem, not handles.

B. Valve Tag Colors -
1. Plumbing: Black tags with white numbers.
2. HVAC: White tags with black numbers.
1. Fire Protection: White tags with red numbers.

C. Valve Tag Locations - At all valves on mains, risers and branches (not equipment service valves).

D. Valve Tag Numbers - Starting with Number 1, number tags in sequence from the lowest point to the highest point in the building.

1.21 VALVE CHARTS

A. Furnish and install valve charts with aluminum frames and glass covers in all mechanical rooms. Provide charts showing number and locations of all labeled valves, type of service, etc.

1.22 EQUIPMENT IDENTIFICATION

A. General - Provide 2" X 3" or larger laminated plastic nameplates with ½" numbers and letters in colors specified below. Screw tags to equipment in obvious locations. Secure nameplates with acorn head screws. Engrave equipment designation and numbers as shown on plans and drawings on upper half of tag, leaving lower half of tag for future engraving by Owner.

B. Motor Starters - Provide similar nameplates for motor starers furnished under this section.

C. Colors -
1. Equipment connected to utility power only - black letters on white nameplates.
2. Equipment connected to emergency power - red letters on white nameplates.

1.23 USE OF BUILDING SYSTEMS FOR TEMPORARY HEAT/AIR CONDITIONING DURING CONSTRUCTION

A. General - Building HVAC systems shall not be used during construction unless the following conditions are met:
1. Cleaning of water systems shall have been completed.
2. Equipment specified hereinafter to have factory supervised start-up shall have had such start-up.
3. All return air and outside air openings shall have temporary MERV 8 filter media installed over inlet side of openings and secured air tight there-to.
4. Air filters of quality specified for ultimate use shall be installed in the air handling units. At no time shall a HVAC system be operated without air filters. The Contractor shall maintain clean air filters in the HVAC systems during all periods of their operation.
5. Motors shall have correct overload elements installed in the starters.
6. Water treatment chemicals shall be furnished for all open and closed water systems as hereinafter specified. Contractor shall maintain such charges during construction use of the system.
7. All safety controls shall be in operation.

B. Final Possession of Building - Contractor shall turn system over to Owner in condition equal to that which would have occurred if the systems had not been used during construction. When the Owner takes possession of the facility, the Contractor shall install clean air filters in all required locations of the HVAC systems

PART 2 - PRODUCTS

2.1 100% OUTSIDE INDOOR PACKAGED UNIT WITH ENERGY RECOVERY (ERU)

A. General - Furnish and install an indoor horizontal dedicated outside air system (DOAS) designed to provide fresh air and control outside air temperature and humidity levels introduced into the conditioned space. It shall have the performance, electrical characteristics, and air path configurations as defined in the product schedule for the space having fresh air delivered at room neutral design conditions. A wiring diagram shall be affixed to each unit. A printed Installation, Operation and Maintenance Manual shall be provided with each unit. All units shall be suitably labeled for safety purposes and for access. Unit and refrigeration system(s) shall comply with ASHRAE 15, Safety Standard for Mechanical Refrigeration Unit shall be certified in accordance with UL Standard 1995/CSA C22.2 No. 236-11, safety Standard for Heating and Cooling Equipment. Units shall be factory evacuated, charged with refrigerant R-454B, leak tested, and functionally tested prior to shipment.

Unit shall be shipped with all access panels in place and suitably affixed to prevent damage during transportation and thereafter while in storage either offsite or on the jobsite. Unit shall be stored in a clean, dry place protected from construction traffic and the natural elements. Installing contractor shall follow industry accepted practices and instructions in the Installation, Operation and Maintenance manual for moving unit where required. Unit or any portion of the unit shall not be disassembled in the field, except as designed for, in order to facilitate placement into the building or mechanical space. Any disassembly of the unit or unit sections not incorporated into the basic design would act to void the unit warranty and reduce the factory quality assurance process.

B. Cabinet - Cabinet shall be unpainted, non-weatherized and constructed of scratch resistant heavy duty galvanized G90 steel. Cabinet shall be shipped as a self-contained unit on a single skid from the manufacturer. Cabinet shall be assembled using zinc plated fasteners. Unit shall be provided with integral support rails and integral hanging brackets which eliminate the need for external, field-supplied brackets. Brackets shall accommodate the unit being ceiling mounted using hanging rods or slab mounted. Cabinet access panels shall fit into recessed pockets within the cabinet structure and held in place with screws. Recessed areas will be lined with flexible gasket to minimize air leakage. Access panels shall have inserts to easily facilitate panel removal. Panels shall allow side access to key internal components to facilitate installation, maintenance and servicing of the unit. Cabinet shall be constructed so that thermal bridging does not occur. The inlet and discharge of the unit shall be configured as indicated on the plans.

Cabinet and removable panels shall be double-wall construction with interior panels consisting of solid galvanized metal. Cabinet and removable panels shall be lined with 2”, R-8 fiberglass thermal/acoustic insulation having an approximate density of 1.9 lbs. / ft^3 which meets NFPA 90A and 90B/ASTM-C1071, Type 1 / ASTM E 84 / CAN/ULC S102-M88 / CAN CGSB-51.11 requirements. Insulation shall be a dual density fiberglass, comprised of a 1.2 lbs. / ft^3 flexible core and a 4.0 lbs. / ft^3 density, 1/8” face. Insulation shall be certified to meet The GREENGUARD Environmental Institute air quality standards and product emission standards for VOC’s. Insulation shall not promote or support the growth of fungi or bacteria. Insulation shall include an acrylic polymer coating to help guard against the incursion of dust and dirt into the substrate.

C. Enthalpy Wheel - The system shall utilize a total enthalpy wheel to capture waste heat energy from the building exhaust air stream for conditioning of the entering outdoor air stream. The energy recovery component shall incorporate a rotary wheel in an insulated cassette frame complete with seals, drive motor and drive belt. The wheel shall not allow more than 5% crossover between the supply and exhaust air stream. The total energy recovery wheel shall be coated with silica gel desiccant permanently bonded without the use of binders or adhesives, which may degrade desiccant performance. The substrate shall be lightweight polymer and shall not degrade nor require additional coatings for application in marine or coastal environments. Coated segments shall be washable with detergent or alkaline coil cleaner and water. Desiccant shall not dissolve nor deliquesce in the presence of water or high humidity. The wheel shall be wound continuously with one flat and one structured layer in an ideal parallel plate geometry providing laminar flow and minimum pressure drop-to-efficiency ratios. The layers shall be effectively captured in stainless steel wheel frames or aluminum and stainless steel segment frames that provide a rigid and self-supporting matrix. The wheels shall be provided with removable energy transfer matrix. Wheel frame construction shall be a welded hub, spoke and rim assembly of stainless, plated and/or coated steel and shall be self-supporting without matrix segments in place. Segments shall be removable without the use of tools to facilitate maintenance and cleaning. Wheel bearings shall be selected to provide an L-10 life in excess of 400,000 hours. Rim shall be continuous rolled stainless steel and the wheel shall be connected to the shaft by means of taper locks. All diameter and perimeter seals shall be provided as part of the cassette assembly and shall be factory set. Drive belts of stretch urethane shall be provided for wheel rim drive without the need for external tensioners or adjustment.

D. Plate Heat Exchanger - The plate heat exchanger will be of aluminum material. Maximum temperature 190°F.

E. Refrigerant Circuit - Refrigerant circuit shall be provided with high and low-side Schrader access valves, sight glass with integral moisture indicator, filter-drier, maximum operating pressure (MOP) expansion valve with external equalizer line, manual reset high and auto-reset low pressure safety switches. Refrigerant circuit will be factory leak tested, evacuated, and charged with R-410A refrigerant and run tested prior to shipment. Units shall contain a 1-row auxiliary coil and a receiver tank for refrigerant management.

   The reheat coil shall be constructed of one row of copper tubing mechanically expanded into aluminum fins. The fin spacing shall be 13fins per inch. The reheat coil shall be vertically mounted a minimum of 8” after the evaporator coil for ease of cleaning and to prevent re-hydration of the condensate from the evaporator coil. The Compressor section is to be provided with resealable refrigerant fittings in order to allow for compressor change at the ceiling level requiring no recovery of refrigerant, brazing, and evacuation or charging of the unit using a factory compressor retrofit kit. Heat Pump Cycle unit will be equipped with a solenoid valve operating a 4 way valve. In addition the refrigeration circuit will shall contain a suction accumulator and filter drier.

F. Compressor - Refrigerant circuit (.75 ton) shall utilize a single reciprocating compressor. Reciprocating compressors shall be mounted on vibration isolators to ensure quiet operation. Each reciprocating compressor shall be protected internally from overheating. Compressor shall be mounted outside the air stream in an insulated compartment. Compressor circuit shall be protected with a high and low pressure safety switch.

G. Evaporator Coil Section - Shall be made with heavy wall seamless copper tubes mechanically expanded into tempered aluminum fins with drawn self-spacing collars. Coil end sheets shall be hot-dipped galvanized. Coils shall be 6 rows deep and 13 FPI for uniform performance and optimum part load and humidity operation. All coils shall be factory leak checked under pressure. Dual circuit units shall utilize interlaced evaporator coils. Maximum Operating Pressure (MOP) is adjustable thermostatic expansion valves, externally equalized, and shall feed each circuit in the evaporator coil. Evaporator coil section shall be equipped with a double sloped 304 stainless steel drain pan with 1 1/4" NPT female connection condensate drain connection located on the side of the cabinet. Drain pan shall extend to the entire length and width of the evaporator coil. Evaporator section air path shall be as shown on project drawings. Auxiliary Coil installed in the supply air stream

H. Blower/Motor Assembly - Unit shall incorporate ECM blowers. The unit supply and exhaust fan shall consist of centrifugal backward curve fan with 96% efficiency electronically commutated motor (ECM). The motor RPM shall be directly set by the package unit control system. The balancing contractor shall have direct access to set the motor RPM through the unit control system Section shall include a factory-installed, pressure differential type loss of air flow proving switch that is set to read pressure drop across the evaporator blower section. Upon loss of air flow, this control shall terminate system operation.

I. Filters - The filter inserts shall be factory mounted in the unit cabinet and shall be accessible from either side. Slide shall be provided within the filter insert for easy removal of all the filters. Filter inserts to be available for combination of filter configurations. Evaporator air filters shall be nominal MERV 8 pleated, throwaway type panel filters consisting of cotton and synthetic or synthetic only media with galvanized expanded metal backing and moisture resistant enclosing frame. The filter shall be classified for flammability by Underwriters Laboratories, Inc. as Class 2. The filter media shall have an efficiency of MERV 8 based on ASHRAE test standard 52.2. The filter face area shall contain not less than 10 pleats per lineal foot. Media support shall be heavy gauge expanded, electro-galvanized metal with grid members being no less than 0.025"wide, providing an open area of not less than 96%. The grid shall be 100% bonded to the media on the air exiting side to eliminate media vibration and pull-away. The grid shall be formed to provide a uniform V-shaped pleat with the open area on the air exiting matched to the open area on the air entering side for maximum utilization of the media and low airflow resistance. The enclosing frame shall be constructed of a rigid, high wet strength board.

J. Non-Fused Disconnect – UL approved indoor non fused disconnect shall be factory installed.

I. Electrical - The electrical system shall conform to National Electric Code (NEC) requirements. Unit shall have a single isolated electrical control panel located out of the air stream. Access to the control panel shall be from the right side of the unit. A single point power connection shall be provided through the right side of the cabinet. Power shall be connected to factory installed terminal blocks. Ground lug shall be affixed in the control panel. All electrical components (blower motor, compressor(s), etc.) shall have individual definite purpose contactors. A low-voltage transformer, with protection, shall be provided to supply 24 VAC to the control circuit. Terminal strips and blocks shall be factory installed internal to the control box and be clearly labeled for control wiring connections. External control wires shall enter the cabinet through the right side of the cabinet. Terminal blocks shall be factory provided for a Remote On / Off switch capability.

Controls shall be suitably wired and enabled to accept a signal from a field supplied Remote On / Off switch. Each component shall be safety agency listed as required. All electrical components shall be labeled to coordinate with the unit wiring diagram provided.

J. Control System - The unit shall contain the OA3 self-contained programmable microprocessor controller. The factory mounted controller shall include the following:
   - An 8 line by 22 character white backlit LCD wall mounted screen display shipped loose for field mounting.
   - English Text
   - System Status Display
   - Active Temperature Display
   - 6 Button Navigation / Submenu
   - Manual control from the controller keypad.
   - Password protection (Optional)
   - Automatic restart from a loss of power
   - Real Time Clock (back up of clock during power outage)
   - Duct Mounted Temperature / Humidity Sensor
   - High & Low Refrigerant Pressure Safety Switch Inputs
   - Anti-short Cycle Protection
   - 4 MB Flash memory
   - 8 Analog inputs
   - 14 Digital inputs
   - 3 Analog outputs
   - 14 Digital outputs
   - Plastic housing shall be DIN Rail mounted
   - Plug-In Screw Down Type connectors
   - Alarm history (Up to 50 alarms)
   - System Enables Menu
   - Time Clock Menu
   - Alarm Set Point Menu
   - Equipment Run Hours Menu
   - Set Point Menu
   - Technician Menu
   - Factory Menu
   - Microprocessor shall include [BACnet™ MS/TP] [BACnet™ IP - Ethernet] [ModBus] [LonWorks®] BMS Interface

   The unit shall provide the following visual and audible alarms:
   - High Refrigerant Pressure (each compressor)
   - Low Refrigerant Pressure (each compressor)
   - Loss of Air Flow
   - Evaporator Motor Overload
   - High Supply Air Temperature
   - Low Supply Air Temperature
   - High Inlet Air Temperature
   - Low Inlet Air Temperature
   - Sensor Failure

   OA3 controller shall be set up to provide room neutral air supply. OA3 controller shall provide a flush cycle for the hot gas reheat circuit. The OA3 controller shall provide the following operating modes:

Dehumidification (Hot Gas Reheat to function as required)
Cooling Mode (Mechanical Cooling or Smart Cooling)
Heating Mode (Mechanical Heating or Smart Heating)
Ventilation Mode
Occupied and Unoccupied Modes (Unoccupied override)

K. Warranty - Manufacturer shall provide a “parts only” limited warranty for a period of 12 months from the date of equipment start-up or 18 months from date of shipment from the factory, whichever is less. Manufacturer shall provide a “compressor parts only” limited warranty for a period of 60 months from the date of equipment start-up or 66 months from date of shipment from the factory, whichever is less. Manufacturer’s limited warranty shall be for parts only. Labor is not included.

L. Installation - Installing contractor shall install unit in accordance with industry accepted practices and Installation, Operation and Maintenance Manual. Industry accepted Start-Up procedures and requirements shall be complied with to ensure safe and reliable operation of the unit.

M. Manufacturer - United CoolAir Alpha-Air Series AAV; or equal by Desert Aire or Mitsubishi.

2.2 SPLIT-SYSTEM HEAT PUMP SYSTEM (INDOOR SECTION) (FC-1 & FC-2)

A. General - Packaged air handling unit shall include a high density insulated casing, centrifugal fan, motor, starter, control transformer, cooling coil, electric heater (where indicated on the plans), insulated drain pan, and all accessories required for proper, safe and reliable operation. Unit shall be constructed in accordance ETL and ETLC standards and shall carry the ETL and ETLC labels.

B. Base Unit - Cabinet shall be constructed of mill-galvanized steel. Cabinet panels shall be fully insulated with 1" thick, R 4.2 fire-retardant material. Insulation and adhesive shall comply with NFPA-90A requirements for flame spread and smoke generation. Insulation shall contain an EPA registered immobilized antimicrobial agent to resist the growth of bacteria and fungi as proven by tests in accordance with ASTM standards G21 and 22. Unit condensate drain pan shall have the ability to be sloped toward either side of the unit to prevent standing water from accumulating and have drain connections on either side of the unit. the cabinet shall meet the requirement of 2% leakage rate when tested at 1.0 inches of static pressure.

C. Fan - Fans shall be tested and rated in accordance with AMCA 210. Fans shall be direct drive type. Unit shall have a programmable Electronically Commutating Motor (ECM) blower motor which shall be static pressure independent to deliver scheduled airflow and which soft ramp up on start and soft ramp down when the thermostat satisfies. Motor shall have internal overload protection and be resiliently mounted. Fan wheels shall be heavy-duty, forward curved, double-width, double-inlet (DWDI) type mounted on a polished steel shaft coated with a rust inhibitor. Bearings shall be designed for a minimum L-10 life of 120,000 hours.

D. Filters - Filter shall be installed in the access section of the unit and shall be serviced from either side of the unit. Furnish two (2) sets of 2" MERV 8 pleated filters.

E. DX Heat Pump Coil - Direct expansion coil shall be fabricated of internally rifled copper tubing with sine wave aluminum fins bonded to the tubes by mechanical expansion. Suction and liquid line connections shall be located on the same side of the coil. Direct expansion heat pump coils shall have factory installed thermostatic expansion valves, bypass line and check valve assembly. Coils shall be designed and tested in accordance with ASHRAE 15 Safety Code for Mechanical Refrigeration. Coils shall be burst tested at 435 psi and leak tested at 150 psi.

F. Electric Heater - Electric heater shall be factory installed in the unit where indicated on the plans. Heaters shall be ETL agency approved and shall meet all NEC requirements. Heating elements shall be 80% nickel and 20% chromium. The heater shall be provided with thermal overload relay. Primary over-temperature protection shall be disc-type automatic reset thermal cutout. Secondary protection shall be heat limiters in the power legs. Heater assembly shall have single power wiring and shall include contactors with 24-v coils, power wiring, 24-v control wiring terminal blocks and a hinged access panel.

G. Manufacturer - Carrier Series FT5A; or approved equal by Trane, Bryant or Lennox.

2.3 SPLIT-SYSTEM HEAT PUMP SYSTEM (OUTDOOR SECTION) (HP-1 & HP-2)

A. General - Split system two-stage air-to-air heat pump units shall comply with the requirements listed in this Section and capacities, performance and arrangements as indicated on the plans. Unit shall be completely factory assembled, piped, internally wired and run-tested to check cooling and heating operation, defrost initiation and termination, fan rotation and control sequence. Outdoor units shall include hermetic compressor, fans, motors, drives, outdoor coil and all accessories required for proper, safe and reliable operation. Outdoor unit shall be pad mounted as indicated on the Drawings.

B. Compressors - The outdoor unit shall be furnished with two-stage scroll hermetic compressor. Compressor shall be mounted on vibration isolators. Reciprocating compressors shall be furnished with crankcase heater. Refrigerant circuit shall be provided with a suction line accumulator and biflow filter/dryer. A heavy duty, high capacity solenoid type reversing (four-way) valve shall provide automatic refrigerant cycle changeover.

C. Outdoor Coil - Outdoor coils shall be specifically designed for heat pump application. Coil shall be fabricated of seamless copper tubing. Coils shall have continuous aluminum plate fins. Coils shall be factory-tested, vacuum dehydrated at 175 degrees F and shipped with dry holding charge.

D. Outdoor Fans - Outdoor fans shall be of the propeller type with aluminum blades. All exposed fan and shaft surfaces suitably weatherproofed. Fan motors shall be totally enclosed type designed for outdoor application with built-in thermal overload protection. All fan electrical wiring shall be factory installed in accordance with NEMA Standards. Fans shall be statically and dynamically balanced, provide vertical air discharge and shall turn in aerodynamically shaped orifices.

E. Unit Casing - The casing shall be galvanized steel with a baked on polyester powder finish.

F. Refrigerant Piping and Accessories - Refrigerant piping shall be Type L hard ACR copper tubing with wrought copper fittings. Size tubing per manufacturer's recommendations. Unit shall have servicing valves accessible from outside the unit casing with service ports.

G. Unit Controls - Control panel shall be furnished with the unit and shall include main power disconnect, fuses, starters, relays and magnetic contactors for compressors and fan motors. A 24 volt control power transformer shall be furnished with the indoor unit. Internal control and power wiring shall be numbered and harnessed and shall be connected to numbered terminal strips.

Outdoor unit operating and safety controls shall include high pressure cutout, low pressure cutout, crankcase heaters, freezestat, compressor overload protection and compressor motor winding thermostat for each compressor. A time and temperature initiated solid state defrost control board shall be provided with three field selectable time periods. Control circuit shall incorporate a 5 minute short cycling relay, which shall lock out the compressor to prevent short cycling. A low ambient outdoor fan motor speed controller, winter start relay, and isolation relay shall be provided to allow cooling operation down to 0 degrees F.

H. Refrigerant - Refrigerant shall be Puron Advance™ (R-454B).

I. Manufacturer - Carrier Series 27TPA8; or approved equal by Trane, Bryant or Lennox.

2.4 DUCTLESS SPLIT SYSTEM HEAT PUMP INDOOR SECTION - WALL-MOUNTED TYPE (FC-3)

A. General - Furnish and install indoor, direct-expansion, wall-mounted fan coils as indicated and scheduled on the plans. Unit shall be complete with a cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and an integral temperature sensing. Unit shall be furnished with an integral wall mounting bracket and mounting hardware. Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system. Units shall be stored and handled per the unit manufacturer's recommendations.

B. Unit Cabinet - Cabinet discharge and inlet grilles shall be attractively styled, high-impact polystyrene. Cabinet shall be fully insulated for improved thermal and acoustic performance.

C. Fan - Fan shall be the tangential direct-drive blower type with air intake at the top of the unit and discharge at the bottom front. An automatic, motor-driven vertical air sweep shall be provided as standard equipment. The air sweep operation shall be user selectable. The vertical sweep may be adjusted (using the remote control). The horizontal air direction may be set manually.

D. Coil - The coil shall be a copper tube with aluminum fins and galvanized steel tube sheets. The fins shall be bonded to the tubes by mechanical expansion and blue hydrophilic pre-coated. A drip pan under the coil shall have a drain connection for the hose attachment to remove condensate. The condensate pan shall have an internal trap.

E. Motor - Motor shall be open drip-proof, permanently lubricated ball bearing with inherent overload protection and 4-speeds.

F. Controls - Controls shall consist of a microprocessor-based control system which controls the space temperature, determines the optimum fan speed and runs self diagnostics. The temperature control range shall be 62° F to 86° F in increments of 1°F and have a 46°F Heating Mode (Heating Setback).

The wireless remote controller shall have the ability to act as the temperature sensing location for room comfort. The unit shall have the following functions as a minimum:

1. An automatic restart after a power failure at the same operating conditions as at failure.
2. A timer function to provide a minimum 24-hour timer cycle for the system's Auto Start/Stop.
3. Temperature-sensing controls sense the return air temperature.
4. Indoor coil freeze protection.
5. Wireless infrared remote control to enter set points and operating conditions.
6. Automatic air sweep control to provide on or off activation of air sweep louvers.
7. Dehumidification mode which provides increased latent removal capability by modulating system operation and set point temperature.
8. A fan-only operation to provide room air circulation when no cooling is required.
9. Diagnostics to provide continuous checks of the unit operation and warn of possible malfunctions. Any error messages are displayed at the unit.
10. The fan speed control is user-selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
11. Automatic heating-to-cooling changeover in the heat pump mode. Control includes deadband to prevent rapid mode cycling between heating and cooling.
12. Indoor coil high temperature protection is provided to detect excessive indoor discharge temperature when unit is in the heat pump mode.

G. Filters - The unit shall be equipped with a filter track with factory-supplied cleanable filters.

H. Electrical Requirements - The indoor fan motor shall operate on 208 volts or 230 volts, 1 phase, 60 Hz electrical service with power supplied from the outdoor unit.

I. Refrigerant Piping - All units should have refrigerant lines that could be oriented to connect from the left, right or back of unit. Both refrigerant lines must be insulated.

J. Manufacturer - Carrier Series 45MAHQB or equal by Mitsubishi, Sanyo or Trane.

2.5 DUCTLESS SPLIT SYSTEM HEAT PUMP INDOOR SECTION - CEILING MOUNTED CASSETTE TYPE (FC-4 & FC-5)

A. General - Furnish and install indoor, direct expansion, ceiling mounted fan coils as indicated and scheduled on the plans. Unit shall be complete with a cooling/heating coil, fan, fan motor, piping connectors, electrical controls, microprocessor control system, and an integral temperature sensing. Unit shall be rated per AHRI Standards 210/240 and listed in the AHRI directory as a matched system. Units shall be stored and handled per the unit manufacturer's recommendations.

B. Unit Cabinet - Cabinet shall be constructed of zinc coated steel. Fully insulated discharge and inlet grilles shall be attractively styled, high impact polystyrene. Grille shall have hinges which can be opened to obtain access to the cleanable filters, indoor fan motor and control box.

C. Fan - The fan shall be a centrifugal direct drive blower type with an air intake in the center of the unit and a discharge at the perimeter. An automatic, motor driven vertical air sweep shall be provided with automatic motor driven louvers to provide adjustable for a 2, 3 or 4 way discharge. The air sweep operation shall be user selectable.

D. Coil - The evaporator coil shall have copper tubes with aluminum fins and galvanized steel tube sheets. Fins shall be bonded to the tubes by mechanical expansion and specially golden hydrophilic pre coated for enhanced wet ability. A drip pan under the coil shall have a factory installed condensate lift pump and a drain connection for a hose attachment to remove condensate.

E. Motor - Motor shall be open drip proof, permanently lubricated ball bearing with inherent overload protection and 7 speeds.

F. Controls - Controls shall consist of a microprocessor based control system which controls the space temperature, determines the optimum fan speed and runs self diagnostics. The temperature control range shall be 62° F to 86° F in increments of 1°F and have a 46°F Heating Mode (Heating Setback). The wireless remote controller shall have the ability to act as the temperature sensing location for room comfort. The unit shall have the following functions as a minimum:
    1. An automatic restart after a power failure at the same operating conditions as at failure.
    2. A timer function to provide a minimum 24 hour timer cycle for the system's Auto Start/Stop.
    3. Temperature sensing controls sense the return air temperature.
    4. Indoor coil freeze protection.
    5. Wireless infrared remote control to enter set points and operating conditions.
    6. Automatic air sweep control to provide on or off activation of air sweep louvers.
    7. Dehumidification mode which provides increased latent removal capability by modulating system operation and set point temperature.
    8. A fan only operation to provide room air circulation when no cooling is required.
    9. Diagnostics to provide continuous checks of the unit operation and warn of possible malfunctions. Any error messages are displayed at the unit.
    10. The fan speed control is user selectable: high, medium, low, or microprocessor controlled automatic operation during all operating modes.
    11. Automatic heating to cooling changeover in the heat pump mode. Control includes deadband to prevent rapid mode cycling between heating and cooling.
    12. Indoor coil high temperature protection is provided to detect excessive indoor discharge temperature when unit is in the heat pump mode.

G. Filters - The unit shall be equipped with a filter track with factory supplied cleanable filters.

H. Electrical Requirements - The indoor fan motor shall operate on 208 volts or 230 volts, 1 phase, 60 Hz electrical service with power supplied from the outdoor unit.

I. Refrigerant Piping - All units should have refrigerant lines that could be oriented to connect from the left, right or back of unit. Both refrigerant lines must be insulated.

J. Manufacturer - Carrier Series 45MBCAQ or equal by Gree, Mitsubishi, Sanyo or Trane.

2.6 DUCTLESS SPLIT SYSTEM HEAT PUMP - OUTDOOR SECTION FOR SINGLE INDOOR SECTION (HP-3, HP-4 & HP-5)

A. General - Furnish and install a factory assembled, single piece, air-cooled outdoor unit as indicated and scheduled on the plans. Unit shall consist of a rotary compressor, an air-cooled coil, propeller-type draw-through outdoor fan, reversing valve, accumulator, metering device, multiple service valves, and controls. Unit shall discharge horizontally as shown on the contract drawings. Unit shall function as the outdoor component of an air-to-air heat pump system.

Unit shall be designed to be used in a refrigeration circuit matched to a ductless heat pump fan coil unit. Unit construction shall comply with ANSI/ASHRAE 15, latest revision, and with NEC. Unit shall be evaluated in accordance with UL standard 1995 and be listed in CEC directory. Unit cabinet shall be capable of withstanding 500-hour salt spray test per Federal Test Standard no. 141 (method 6061). Air-cooled condenser coils shall be leak tested at 550 psig. Units are shipped in one piece and are stored and handled per the manufacturer's recommendations.

B. Unit Cabinet - The unit cabinet shall be constructed of galvanized steel, bonderized and coated with baked-enamel finish on inside and outside. The unit access panel shall be removable with the minimal screws and provides full access to the compressor, fan, and control components. The outdoor compartment shall be isolated and have an acoustic lining to assure quiet operation.

C. Fans - The outdoor fans shall be direct-drive propeller type, and discharge air horizontally. The fan shall draw air through the outdoor coil. Outdoor fan motors shall be totally-enclosed, single phase motors with Class E insulation and permanently lubricated ball bearings. The motor shall be protected by internal thermal overload protection. The fan motor shaft shall have an inherent corrosion resistance. Outdoor fan openings shall be equipped with metal/mesh PVC coated protection grille over fan.

D. Compressor - The compressor shall be fully hermetic rotary type. The compressor shall be equipped with an oil system, operating oil charge, and motor. The compressor motor shall be NEMA rated Class E, suitable for operation in a refrigerant and oil atmosphere. The compressor assembly shall be installed on rubber vibration isolators.

E. Outdoor Coil - The coil shall be constructed of aluminum golden hydrophilic pre-coated fins mechanically bonded to seamless copper tubes, which have been cleaned, dehydrated and sealed.

F. Refrigerant Components - Refrigerant circuit components shall include a brass external liquid line service valve with service gauge connection ports, a suction line service valve with a service gage connection port, service gage port connections on compressor suction and discharge lines with Schrader type fittings with brass caps, accumulator, and reversing valve.

G. Safeties - Operating safeties shall be factory selected, assembled, and tested. The minimum functions shall include the following:
   1. Compressor motor current and temperature overload protection.
   2. A time delay control sequence through fan coil circuit board.
   3. System diagnostics.

4. Outdoor fan failure protection.

H. Electrical Requirements - Units shall operate shall operate on 208 volts or 230 volts, 1 phase, 60 Hz electrical service and have a single point connection. All power and control wiring must be installed per NEC and all local electrical codes. Units have high and low voltage terminal block connections.

I. Warranty - The units shall have a manufacturer's parts and defects warranty for a period one (1) year from date of installation. The compressor shall have a warranty of 5 years from date of installation. If, during this period, any part should fail to function properly due to defects in workmanship or material, it shall be replaced or repaired at the discretion of the manufacturer. This warranty does not include labor.

J. Manufacturer - Carrier Series 37MARAQ or equal by Mitsubishi, Sanyo or Trane.

2.7 GAS-FIRED LOW INTENSITY RADIANT TUBE HEATER (GIH)

A. General - Contractor shall furnish and install low intensity infrared heater(s). The low intensity infrared system shall be straight tube configuration. Performance shall be as indicated on the equipment schedule in the plans. The infrared heater(s) shall be certified for indoor and outdoor installations. Infrared heater(s) shall have ETL design certification.

B. Casing - The controls, combustion air blower and burner shall be housed in a water-resistant casing, providing weatherproof protection. The burner and control box casing shall be constructed of not less than 20 gauge aluminized steel. After forming, the casing parts shall be cleaned of all oils and a phosphate coating applied prior to painting. The phosphated parts shall then be finished with an electrostatically applied, gray-green polyester powder paint finish. The applied polyester powder paint shall be baked on to provide an attractive finish on all of the exposed casing parts.

C. Heat Exchanger - The heat exchanger tubes and combustion chamber shall be constructed of 16 gauge, 4" O. D. aluminized steel, and the first combustion tube for gas inputs 150,000 Btuh and greater shall be 16 gauge 4" O. D. 409 Aluminized Stainless Steel. The last heat exchanger tube shall incorporate a turbulator baffle for maximum efficiency of heat transfer. The heat exchanger tubes must be used in conjunction with reflectors. The reflector can be adjusted from 0° to 45° from the horizontal plane. Reflectors shall be of bright polished aluminum.

D. Motor - Each heater shall have a single motor. The combustion air blower motor shall be totally enclosed in the control box and the motor shall be protected by a thermal overload switch. The motor shall be .03 H.P., 115 volt, 60 Hz, single phase, with an operating speed of 3000 rpm.

E. Controls - Input power to the infrared heater(s) shall be 115V/60Hz/1ph. Heater(s) shall be equipped with a direct four-trial (three re-trial), 100% shut-off electronic ignition control system with a separate flame sensor. Infrared heater(s) shall be equipped with a 115V/25V control transformer. Thermostat shall operate on 25V. Heater(s) will be equipped with a prepurge mode, a differential pressure switch, and an indicator light to prove proper operation of the gas valve. All controls shall be rated for a maximum inlet pressure of 1/2 PSI gas pressure. Controls shall be designed for propane gas.

F. Gas Vent Pipe - Gas vent pipe shall be rated for use on ANSI Category III gas appliances and for positive pressure venting. Vent pipe shall be an air-insulated double wall product having stainless steel inner liner and outer jacket. Vent shall be installed in accordance with the manufacturer's installation instructions. Vent shall be equal to heat-fab Saf-T Vent CI Plus system.

G. Warranty - All units and component assemblies shall be warranted for a period of one year from date of shipment from factory or 18 months from date of manufacture, whichever occurs first. All burners, heat exchanger, and draft diverters shall carry a five year non-prorated limited warranty on materials and workmanship.

H. Manufacturer - Modine Series IPT: or equal by Reznor or Hastings.

2.8 EXHAUST FANS

A. General - All exhaust fans shall be of type and capacities as shown on drawings. All fans shall bear the AMCA Seal and be performance rated in accordance with AMCA Standard 210. Each fan shall be complete with housing, motors, drives, fans, etc., in addition to other components specified hereinafter.

B. Wall Propeller Exhaust Fan (WEF) - Greenheck Series SE1 direct drive, axial type sidewall fans. Propellers shall be constructed with fabricated steel, fabricated aluminum, or cast aluminum blades and hubs. A standard square key and set screw or tapered bushing shall lock the propeller to the motor shaft. All propellers shall be statically and dynamically balanced to AMCA Standard 204-05.

Motor shall be an electronic commutation (EC) motor specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by a potentiometer dial mounted on the motor. Motor shall be a minimum of 85% efficient at all speeds. Motor drive frame assemblies and fan panels shall be galvanized steel or painted steel. Drive frame assemblies shall be welded wire or formed channels and fan panels shall have prepunched mounting holes, formed flanges, and a deep formed inlet venturi. Drive frames and panels shall be bolted construction or welded construction. The axial exhaust or supply fans shall bear the AMCA Certified Ratings Seals for Sound and Air Performance. Furnish with gravity backdraft damper, wall housing and OSHA fan guard.

C. Ceiling Exhaust Fan - Shall be equal to Greenheck Series SP. Fan shall be ceiling mounted as indicated on the plans, direct driven, centrifugal exhaust fan. Fan shall be listed by Underwriters Laboratories (UL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance. The fan housing shall be minimum 20 gauge galvanized steel and acoustically insulated. Blower and motor assembly shall be mounted to a minimum 14 gauge reinforcing channel and shall be easily removable from the housing. Motor shall be mounted on rubber-in-shear vibration isolators. Unit shall be supplied with integral wiring box and receptacle.

Discharge position shall be convertible from right angle to straight through by moving interchangeable panels. The outlet duct collar shall include a reinforced aluminum damper with continuous aluminum hinge rod and brass bushings. To accommodate different ceiling thickness, an adjustable pre-punched mounting bracket shall be provided. A powder painted white steel grille shall be provided as standard. Wheel shall be centrifugal forward curved type, constructed of galvanized steel. Wheel shall be balanced in accordance with AMCA standard 204-96, balance quality and vibration levels for fans.

Motor shall be an electronic commutation (EC) motor specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by a potentiometer dial mounted on the motor. Motor shall be a minimum of 85% efficient at all speeds. Motor shall be furnished at the specified voltage and phase.

Fan shall be furnished with disconnect (factory mounted and wired) and backdraft damper as indicated on the plans.

D. Equal Products - Loren Cook, Penn, Jenn Aire, Broan, Carnes, Barry, Acme or approved equal will be acceptable.

2.9 REGISTERS, GRILLES AND DIFFUSERS

A. General - All registers and grilles shall be product of a single manufacturer; shall be constructed of extruded aluminum with baked enamel finish to match adjacent surfaces, except as otherwise specified. Where lay-in type panels and frames are specified, check ceiling suspension system and coordinate interfacing. All diffusers shall be tested in accordance with ANSI/ASHRAE Standard 70. All grilles, diffusers and registers shall be mounted with aluminum countersunk screws with finish to match respective items.

B. Schedule - See plans for Air Device Schedule

C. Similar Products - By Titus, Krueger, Metal Aire, Waterloo, Tuttle and Bailey, Carnes, and Barber-Coleman will be accepted.

2.10 WALL LOUVERS

A. General - Furnish and install where indicated on the drawings stationary extruded aluminum drainable blade louvers equal to Greenheck Model ESD-653; or equal by Industrial Louvers, Ruskin, Arrow United Industries, Greenheck, Penn Ventilator or Airolite.

B. Construction - Frames shall be 6" wide heavy gauge extruded 6063-T5 aluminum, 6 in. (152 mm) x 0.081 in. (2 mm) nominal wall thickness. Blades shall be drainable design, heavy gauge extruded 6063-T5 aluminum, 0.081 in. (2 mm) nominal wall thickness, positioned 37º on approximately 4 in. (102 mm) centers. Louvers shall be welded construction. Screens shall be flattened expanded metal screen inserted in extruded aluminum "U" frame and mounted on interior side of louver.

Louver shall be licensed to bear the AMCA Seal. The ratings shown are based on tests and procedures performed in accordance with AMCA Publication 511 and comply with the requirements of the AMCA Certified Ratings Program. The AMCA Certified Ratings Seal applies to air performance and water penetration ratings.

C. Accessories and Finish - Wall louvers shall be furnished with 0.125" angle aluminum mounting clips and extended sill with end dams. Louvers shall be finished with an AAMA 2605 compliant coatings (70% Kynar PVDF/100% Fluoropolymer FEVE)in a color selected by the Architect.

PART 3 - EXECUTION

3.1 SHEET METAL DUCT WORK

A. Scope - Provide as shown and as required for the air conditioning, heating and ventilation system. Make changes in dimensions, offsets or crossovers as necessary to clear piping, lights and structural members, and to maintain scheduled headroom.

B. Sheet Metal - Prime quality galvanized sheet steel unless otherwise indicated on plans shall be gauges as recommended in the latest edition of SMACNA "HVAC Duct Construction Standards Metal and Flexible" for the following pressure and seal classes:

Duct Application	Pressure Class	Seal Class
All ducts	1" w.g.	C

Where galvanized metal joins aluminum or copper, separate sheets with lead or chromate impregnated felt gaskets.

C. Sizes - Take measurements at job and fit work into available space; report any unworkable conditions encountered. Unless otherwise approved, conform to dimensions indicated.

Duct dimensions shown indicate NET FREE AREA after installation of duct liner; increase sizes indicated to allow therefore.

D. General Fabrication - Construct and erect in a workmanlike manner, meeting requirements of the latest SMACNA "Low Velocity and Duct Construction Standards" and IMC. Form straight and smooth on the inside, with joints neatly finished. Make up in sections of such length that mechanic can reach thru open end to seal insulation at previous joints. Ensure that ducts are sealed at all transverse joints, longitudinal seams and duct wall penetrations. Assemble and anchor so as to be completely free from vibration and drumming under all conditions of operation. Make takeoffs at round ducts with prefabricated round-to-rectangular and rectangular-to-round transitions. Break duct so that manufacturers quality stamp is exposed to view.

E. Cross Joints, Seams and Stiffening - Join and stiffen with combination of joint types and structural angles as recommended in SMACNA "Low Velocity and Duct Construction Standards". Cross break all flat areas over 18 inches wide. Install internal ends of slip joints in the direction of flow. Non-galvanized pieces must be painted before assembling with Tnemec of Rust-Oleum metal primer. Make all cross joints and all branch, grille and diffuser take-off's air tight by applying duct sealer.

F. Turns and Transitions - Fabricate turns with an inside radius not less than 3/4 the width of duct. At 90° turns Contractor may substitute square elbows, with multiple, single-blade constructed vanes. Avoid abrupt changes in shape, with a slope of 5:1 the minimum allowed.

G. Unavoidable Obstructions - Where structural elements or pipes must pass through a duct, provide two-piece streamliners, and enlarge duct to compensate for net loss of area. Round pipes and rods smaller than 3 inches need not have special treatment. Note: this provision will not be used to justify obstructions which can be avoided.

H. Register and Grille Connections - Flange over wall or ceiling surface a minimum of 1/2" to receive sealing gasket on register flanges. Interior of ductwork visible through grilles and diffusers shall be painted flat black.

I. Flexible Connections - Connect all ducts to air handling units and fans (excepting dome type fans) with preassembled flexible connection of fire-resistant, neoprene coated glass fiber cloth (3" fabric width). Install so that cloth is in folds (not drawn tight).

J. Hangers and Supports - Support small horizontal ducts with 1-1/4" x 20 gauge band hangers (1-1/2" x 16 gauge at ducts larger than 70 united inches). Provide in pairs close to each transverse joint and in no case more than six feet apart. Bands shall pass completely under round ducts. At rectangular ducts, bands shall be turned 1" under the lower corner and fastened with self-tapping screws into the bottom surface and at 6" intervals up the sides. Loop top end of hangers over steel structural members above and fasten with galvanized bolts; where concrete joists occur overhead secure straps to side of joist with galvanized expansion or ramset bolts; where flat concrete surface occurs overhead secure with ramset or expansion bolt fasteners.

   Support horizontal ducts larger than 100 united inches on trapeze type hangers, with structural supporting angle, 3/8 inch threaded rods and inserts or clamps as required to accommodate overhead construction. Spacing shall not exceed 8 feet. Support small vertical runs with 1/8" steel bands screwed to 3 sides of duct and expansion bolted to adjacent structural elements; spacing shall not exceed 12 feet. Support vertical runs larger than 50 united inches with structural brackets.

K. Fire Dampers - Provide as shown on drawings in each duct passing through fire walls, floors, and other fire barriers in accordance with IBC and IMC. Install in such manner that fusible links can be replaced. Employ links rated at 160 degrees F. (212 degrees where within 10 feet of heating coil.) Typical dampers shall be UL labeled, 1-1/2 hour rated, equal to Prefco Model 5500 E6 ML type B low resistance frame and factory sleeve. Similar product by Ruskin, American, Nailor, Safe-Air or Air Balance will be accepted. When installed adjacent to a ceiling diffuser or register, the fire damper shall be UL labeled, 1-1/2 hour rated, equal to Prefco Model 5660 UL ceiling damper. Where fire damper is installed adjacent to sidewall register, fire damper shall be equal to Prefco Model 5500 E6 LPB when installed in 2 hour wall. Install in accordance with all applicable conditions of the UL listing, for which data sheets must be submitted for approval. At typical ducts secure fire damper housing/sleeve in wall opening with 1-1/2" x 1-1/2" x 14 ga. (min.) angles; bolt angles and damper sleeve with galvanized bolts. Size structural openings so that space between sleeve and masonry is not less than 1/8" per foot of width and height. Secure duct to fire damper housing/sleeve with slip joint connection.

L. Manual Volume Balancing Dampers - Furnish and install manual volume balancing dampers at locations shown on plans and at each branch supply, return or exhaust duct from the main duct. Frames shall be 5" x 1" x 16 gage galvanized steel channel with corner braces. Blade shall be constructed of 16 gage galvanized steel (maximum 8" depth). Bearings shall be non-corrosive two piece molded synthetic. Axles shall be square or hexagonal to provide positive locking connection to blades and linkage. Linkage shall be concealed to frame. Dampers shall have opposed blade action and dampers that are 11" high and under may be single blade construction. Damper operator shall be equal to Young Regulator Co. Model 443B Valcalox Regulator with lever type handle, 2" high base for externally insulated ducts and hex locknut to securely lock the damper in place. Dampers shall be equal to Model MD35 by Ruskin Manufacturing Company. Similar product by Prefco, Arrow, Greenheck, American, Safe-Air, Nailor or Air Balance will be accepted.

M. Control Dampers - Furnish and install, at locations shown on plans low leakage damper, with published leakage data certified under the AMCA Certified ratings program showing leakage through a 48" x 48" damper at 4 in. w.g. pressure difference to be less than 6.2 cfm per sq. ft. Same published leakage data shall also include leakage information for all available damper sizes at pressure differences from 1 in. w.g. through 13 in. w.g. Low leakage dampers shall meet the following minimum construction standards: Frames shall be 5" x 1" x .125" (minimum thickness)6063T5 extruded aluminum hat channel with hat mounting flanges on both sides of the frame. Each corner shall be reinforced with two die formed internal braces and machine staked for maximum rigidity. Blade shall be airfoil type extruded aluminum (maximum 6" depth) with integral structural reinforcing tube running full length of each blade. Blade edge seals shall be extruded vinyl double edge design with inflatable pocket which pocket which enables air pressure from either direction to assist in blade to blade seal off. Blade Seals shall be locked in extruded blade slots without use of cement, yet shall be easily replaceable in field. Bearings shall be non-corrosive two piece molded synthetic. Axles shall be square or hexagonal to provide positive locking connection to blades and linkage. Linkage shall be concealed to frame.

Damper manufacturer's literature shall include performance data developed from testing in accordance with AMCA Standard 500 in an AMCA approved laboratory showing pressure drop for all sizes of dampers required at all anticipated air flow rates. Dampers shall be equal to Model CD-50 by Ruskin Manufacturing Company. Similar product by Arrow, Greenheck, American, Safe-Air, Nailor or Air Balance will be accepted.

N. Flexible Ducts - Shall be equal to Flexmaster U.S.A., Inc. Type 8M-Insulated and have construction conforming to UL-181 Class 1 Air Duct and NFPA 90A and 90B. The duct shall have a CPE inner film mechanically locked without adhesive; corrosion resistant galvanized steel helix; a thick blanket of glass fiber insulation having a R-value of 8.0 $ft^2\ ^0F$ h/Btu at 75^0F; and a fire retardant reinforced aluminum material vapor barrier jacket with a permeance of 0.05 Perm per A.S.T.M. E96, Procedure A. Equal product by Genflex, Thermaflex or Flex-Vent will be accepted.

Flexible duct shall have a maximum length of six (6) feet. Shall be fastened to the round fittings and take-off fittings with metal clamps or Panduit plastic bands. Joints shall be taped after the clamps or bands are secured. Suspend ducts longer than 3 feet with 22 gauge x 3" wide galvanized saddles hung with 24 gauge x 1" wide straps.

O. Take-Off Fittings for Round Duct - Shall be factory fabricated, side takeoff fittings with manual damper, 3/8" square shaft with U bolt, nylon bearings, Duro Dyne KR-3 locking quadrant and 2" insulation build out equal to Flexmaster U.S.A., Inc. Type STOD-BO3. Equal product by Genflex, Rainaire, Alco or Crown Products will be accepted.

3.2 DUCT INSULATION WORK

A. General - All work by experienced applicators in accordance with manufacturer's recommendations. Duct must be clean, dry and pressure tested before covering is applied. Cover flexible connections with insulation material as hereinafter specified to same thickness as adjacent duct. All insulation and coating materials shall be fire resistive per NFPA Pamphlet No. 90 and shall be UL listed.

B. Supply Air Ducts; Return Air Ducts; Exhaust Air Ducts; and Outside Air Ducts; except double wall spiral ducts - Insulate externally with 3" thickness, 0.75 lb. density, Type 75 glass fiber duct insulation with FRK vapor retarder facing, Johns Manville Microlite XG Formaldhyde-free duct wrap, or equal material by Owens Corning Fiberglas, CertainTeed or Knauf. Thermal conductivity shall be not less than 0.29 BTU per hour, per inch thickness per square foot, per degree F temperature difference at 75^0F mean temperature. Duct wrap insulation shall have a minimum installed R-value of 8.3 $ft^2\ ^0$F h/Btu at 75^0F.

C. Application of Exterior Duct Insulation - Wrap insulation on the duct work with all circumferential joints butted and longitudinal joint overlapped a minimum of 2". Adhere insulation to metal with 4" strips of insulation bonding adhesive at 8" o.c. Additionally secure insulation to the bottom of rectangular duct work over 24" wide with mechanical fasteners at not more than 18" o.c. on circumferential joints, the 2" flange of the facing shall be secured using 9/16" flare-door staples applied 6" o.c. and taped as specified hereinafter. On longitudinal joints, the overlap shall be secured using 9/16" flare-door staples applied 6" o.c. and taped as specified hereinafter. All circumferential and longitudinal joints and all pit penetrations or punctures in vapor barrier facing shall be taped with pre-sized glass cloth adhered & finished with white vapor barrier coating equal to Foster 30-35.

3.3 REFRIGERANT PIPING AND ACCESSORIES

A. General - System shall be complete and sized to conform to current ASHRAE Standards, except that Freon suction risers shall be sized for a gas velocity not less than 2000 fpm.

B. Piping Diagram - Because various manufacturers have different reasons for the use of loops, traps, etc., in piping arrangements, submit for approval a dimensioned isometric piping diagram for each system proposed for use. Each diagram shall show all valves, loops, pipe sizes, etc. Secure approval of the unit manufacturer before submitting. With each diagram, submit catalog data and manufacturer's ratings for all valves, filter driers, moisture and liquid indicator sight glasses, etc. Identify all items for respective systems and list capacities, pressure drops, etc.

C. Piping - Type L hard drawn copper ACR refrigerant tubing with long radius wrought copper solder joint fittings. Provide wall sleeves, hangers and escutcheons as specified for typical piping.

D. Joints - Make up with high temperature silver solder (Sil-Fos or similar) suitable for 300 psig working pressure. Purge dry nitrogen gas through pipe while joints are soldered.

E. Service Valves - Provide where indicated on the plans and/or required for proper servicing of the equipment. Install refrigerant valves in the suction and discharge lines adjacent to the compressor unless built-in double seated valves are factory installed. The refrigerant valves shall be designed for the refrigerant used. Refrigerant access ports shall be fitted with locking-type, tamper-resistant caps.

3.4 DRAINAGE PIPING

A. General Workmanship - Cut accurately to measurements established at site and work into place without springing or forcing, properly clearing all building features. Route thru previously built in sleeves and avoid cutting or other weakening of the structure. Ream all pipe to remove burrs.

Make changes in direction and size with fittings (no bushings will be allowed). Vent the high points of all forced water mains and branches with automatic vents discharged properly to waste. Cap or plug open pipe ends during installation to keep out foreign material. Make connections carefully to eliminate air pockets, and to permit complete drainage of the systems.

B. Condensate Drain Piping - Type L hard copper tubing with wrought copper solder joint fittings. Provide a trap in each drain line with capped or plugged cleanout tees. Trap depth shall be equal to the total system pressure plus one inch.

C. Copper Joints - Make assemblies with tin-antimony (95-5) solder and non-corrosive flux (this does no apply to refrigerant piping). Clean and polish the tube and the inside of the fittings, using No. 60 steel wool. Apply flux and place fitting on the tube. Heat joint evenly, but take care not to overheat fitting. Apply solder until a solder line shows completely around the joint. Remove surplus solder and allow joint to cool.

D. Screw Joints - Properly cut tapered threads and make perfectly tight with a stiff mixture of graphite and oil, brush applied to male threads only.

E. Escutcheons - Provide all pipes passing through the floors, walls or ceilings of finished rooms with chrome plated brass escutcheon plates securely fastened in place with round had set screws.

F. Unions - Provide adjacent to all valves (one side) and mechanical equipment; provide companion flanges on all flanged valves, pumps and other mechanical equipment. Unions shall be of the following types:
Copper Lines; Ground joint, copper to copper.

G. Sleeves - Provide where all pipe passes through floors, walls and other members of the structure. Sleeves in concrete shall be poured in place, and in masonry construction shall be built-in. Cut flush with each surface. Sleeves shall be two pipe sizes larger in diameter than the uninsulated passing pipe. Sleeves in floors or bearing walls shall be Schedule 40 galvanized steel pipe. Sleeves in non-bearing walls shall be 26 gauge galvanized steel. Sleeves through floors and through outside walls shall be caulked air and water tight using backer rod and two part Thiokol sealer. Where pipes pass through combustible materials the openings shall be sufficiently large to provide 1" clearance between the pipe and the floor partition.

3.5 PIPE HANGER AND SUPPORTS

A. Spacing - Install supports as required to prevent sags, bends or vibration; in any case provide within 6 inches of elbows and valves, at ends of branches over 5 feet, and on centers not exceeding the following:

Copper Tubing - up to 1", 6 feet; over 1", 8 feet.

B. At Typical Suspended Horizontal Pipe - Adjustable clevis or split-ring type similar to Fee & Mason 239 or 215.

C. At Horizontal Piping Along Wall - Fee & Mason #146 j-hooks.

D. Vertical Piping Along Wall - Fee & Mason #241 riser clamps at floors and #366 stand-off brackets toggle bolted to wall. Place under hubs or couplings where at all possible.

E. On Insulated Lines - Size hanger loops to fit over insulation, and provide 12" long, 22 ga. galv. sheet metal half-round saddles to protect insulation.

F. Where in Contact with Copper Pipe - Same as above except hangers copper plated.

G. Horizontal Pipe Above Roof - Furnish 4" x 6" cellon treated timbers to General Contractor for installation on roof deck. Support pipe with Fee & Mason #366 offset clamps.

H. Hanger Rods - Of mild steel, threaded as required. Use not smaller than 3/8" rods for pipe 2" and under, 1/2" rods for pipes 2-1/2" through 6", but generally as standard for the hanger selected. Support rods with threaded inserts, expansion shields, or beam clamps. Refrigerant lines to have spring-loaded rods with 1" minimum static deflection.

I. Basis of Design - Fee & Mason; or similar products by Grinnell, Elsen, Stockham, or Crane.

3.6 PIPE AND MISCELLANEOUS INSULATION WORK

A. General Provisions - All work shall be performed by an experienced insulation sub-contractor in accordance with manufacturer's recommendations. Piping must be clean, dry and pressure tested before covering is applied. Size pipe hangers, to fit insulated pipe size (see hangers and supports).

Cover fittings, valves and flanges with insulation material as hereinafter specified to same thickness as adjacent pipe covering (except screwed unions an do the specifically named items.) Neatly bevel covering edges adjacent to unions and other points of termination. All insulation materials (coatings and mastics) shall be fire resistive and UL approved.

B. Refrigerant Piping and Condensate Drains - Insulate with Armstrong "Armaflex" or similar product manufacturers. Install insulation in strict accordance with manufacturer's printed instructions. Where piping is exposed to the outdoors or occurs in a finished area, paint with two coats of Armaflex paint. Insulation thicknesses shall be as follows:

- Refrigerant Piping - 3/4" thickness
- Condensate Drains - 1/2" thickness

3.7 TESTING, START-UP, BALANCING, ETC.

A. General - Conduct tests upon completion of the heating, air conditioning and ventilation installations, and at times as designated by the Architect. Final testing and balancing shall be performed at least four (4) weeks prior to occupancy and after an initial inspection of the mechanical systems by the Engineer and necessary corrections have be done. No testing and balancing shall be started until the building envelope has been completed with all ceilings, windows, interior doors and exterior doors installed. Furnish all necessary personnel and test instruments. Power and fuel is specified under Division 1.

B. Performance Tests - After cleaning, balancing, and testing are completed as specified, test each system as a whole to see that all items perform as integral parts of the system and that temperatures and conditions are evenly controlled through the building. Make corrections and adjustments as necessary to produce the indicated conditions. The capacity tests and general operating tests shall be conducted by qualified personnel. The test shall cover a period of not less than three (3) days and shall demonstrate that the entire system is functioning properly. After building is occupied, make minor adjustments as requested by the Owner.

C. Ductwork - Test all supply, return and exhaust ducts, plenums, and casings and make substantially airtight before covering with external insulation or concealing in masonry. Substantially airtight shall be construed to mean that no air leakage is noticeable through the senses of feeling or hearing at joints. Test supply ductwork under the positive pressure for the respective system. Test return and exhaust ducts, plenum and casing under normal operating conditions. Vacuum clean ducts, plenums, casing and coils as required. Demonstrate operation of fire dampers before installing fusible links. Check that flexible connections are loose and not transmitting vibration.

D. Balancing - Check air flow at supply, return and exhaust grilles and diffusers and outside air intakes with a recently calibrate direct-reading velocity instrument; adjust system to deliver, return or exhaust air quantities within 5 percent of the indicated amounts. Provide instruments and otherwise assist Architect in checking balancing at final inspection.

E. Testing, Balancing and Adjusting - Work shall be performed by firms certified by the Associated Air Balance Council or the National Environment Balancing Bureau. Performance of this work by firms specializing in the testing, balancing, and adjusting of heating, ventilating, and air-conditioning systems will be acceptable provided the testing firms shall have submitted to the Architect adequate documentation as to their competence. Testing and balancing procedures shall be in accordance with AABC National Standards for Balancing of Environmental Systems. Firms shall provide proof of having successfully completed a minimum of five projects of similar size and scope.

F. Testing Procedure - Testing, balancing, and adjusting shall be performed in accordance with AABC National Standards for Total Systems Balance or NEBB Procedural Standards for Testing-Adjusting-Balancing of Environmental Systems, using approved field instruments specified and rendering a concise actual certified report of results.

G. Control Settings - On site settings for all automatic controls, including thermostats, humidity controls, minimum damper settings, fire-safety thermostats, pressure controls, temperature controls, and other similar items shall be provided in the form of a typed tabulated list indicating type of control, location, setting and function.

H. Seasonal TAB - The initial testing and balancing shall not be considered the winter or summer seasonal TAB. The winter or summer seasonal TAB shall take place while the building is occupied during near peak seasonal conditions. The TAB contractor shall notify the Owner at least one week in advance requesting that all air filters be clean and all systems be operational before beginning work. The winter operational testing and balancing shall be performed when the outdoor temperature has fallen and remains below 40° F. The summer operational testing and balancing shall be performed when the outdoor temperature has risen and remains above 90° F.

I. Test Data - Five (5) copies of certified final tests reports shall be submitted on forms required by AABC or NEBB, or in case of firms approved by the Architect, the certified tests reports shall be on recognized forms similar to those of AABC or NEBB.

3.8 AUTOMATIC TEMPERATURE CONTROLS

A. Scope - A complete, fully automatic temperature control system, as shown, specified herein, or required for a complete system. System shall be installed by the Control System Contractor. The Control System Contractor shall be responsible for the complete installation and proper operation of the control system. The Control System Contractor shall have a full service office within 50 miles of the job site. This office shall be staffed with applications and field technicians. This office shall maintain parts inventory and shall have all testing and diagnostic equipment necessary to support this Work, as well as staff trained in the use of this equipment.

B. Electrical Work - Refer to the ELECTRICAL Section. Install all wiring, both line and low voltage, in conduit. Control Sub-contractors shall coordinate thermostat outlet box sizes and arrangements with the Electrical Subcontractor.

C. Equipment Generally - Equipment and materials shall be cataloged products of manufacturers regularly engaged in the production and installation of HVAC control systems. Products shall be manufacturer's latest standard design and have been tested and proven in actual use. UL approved; electric type unless otherwise specified. Must be standard catalog products of a single manufacturer, Honeywell, Johnson, Penn, Robertshaw, or approved equal as recommended by the manufacturer to accomplish the required functions, and subject to the specified requirements.

D. Changes in the Work - Changes in the work consisting of additions, deletions, or other revisions within the general scope of the contract may be ordered without invalidating the contract, the contract sum and the contract time being adjusted accordingly. All such changes in the work shall be authorized by written Change Order, and shall be executed under the applicable conditions of the Contract Documents.

E. Correction of Work
   1. The Contractor shall promptly correct all work found finds defective or failing to conform to the Contract Documents. The Contractor shall bear all cost of correcting such work.
   2. If, within the warranty period required by the Contract Documents, any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of written notice to do so. Prompt notice shall be given after discovery of the condition.

F. Coordination During Construction
   1. The Contractor shall coordinate any changes in work scheduling to minimize the disruption.
   2. The Contractor shall protect the installed works by other trades.
   3. The Contractor shall coordinate with other trades.
   4. The Contractor shall repair any damage caused by his work to building(s) and equipment at no additional cost to the owner.

G. Warranty - The Contractor shall warrant that all systems, subsystems, component parts, and software are fully free from defective design, materials, and workmanship for a period of one year from the date of final acceptance.

H. Submittals
   1. Shop Drawings. A minimum of 4 copies of shop drawings shall be submitted and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Shop drawings shall also contain complete wiring, routing, schematic diagrams, tag number of devices, software descriptions, calculations, and any other details required to demonstrate that the system will function properly. Drawings shall show proposed layout and installation of all equipment and the relationship to other parts of the work.
   2. Shop drawings shall be approved before any equipment is installed. Therefore, shop drawings must be submitted in time for review so that all installations can be completed per the project's completion schedule. Ten working days shall be allowed for review of submittals.
   3. All drawings shall be reviewed after the final system checkout and updated or corrected to provide “as-built” drawings to show exact installation. All shop drawings will be acknowledged in writing before installation is started and again after the final checkout of the system. The system shall not be considered complete until the “as-built” drawings have received their final approval. The Contractor shall deliver 4 sets of “as-built” drawings.

I. Operations and Maintenance Manuals - Operations and maintenance manuals for the system shall include the following categories; Users Manual; Product Information. Project specific manuals shall include detailed information describing the specific installation.
   1. Users Manual - System reference material shall contain as a minimum, an overview of the system, its organization, the concepts of networking and central site/field hardware relationships.

   2. Product Information - It shall include detailed information on hardware and design requirements for initial installations and/or additions to existing systems. Installation mounting and connection details for field hardware, accessories and central site equipment.

J. Acceptance Test and Acceptance
   1. Upon completion of the installation, the Contractor shall start up the system and perform all necessary calibration, testing, and debugging operations. An acceptance test shall be performed by the Contractor in the presence of the Owner's representative.

   2. When the system performance is deemed satisfactory, the system parts will be accepted for beneficial use and placed under warranty. At this time, a "notice of completion" shall be issued and the warranty period shall start.

K. Owner's Instructions - The Contractor shall provide full instructions to designated personnel in the operation, maintenance, and programming of the system. The training shall be specifically oriented to the system and interfacing equipment installed. Eight (8) hours of training for the system shall be provided.

L. Smoke Detectors - Smoke detectors shall be photoelectric system type and shall be UL Listed per UL 268A specifically for use in air handling systems. Install in accordance with the manufacturer's recommendation and NFPA 72 and 90A. Detectors shall have an indicator lamp to denote an alarm condition. Also provide a set of auxiliary contacts, one each normally open and normally closed.

Photoelectric detectors shall be factory calibrated. The sensitivity of any photoelectric detector shall be factory set at 3.2 percent plus or minus 0.5 percent obscuration per foot. These detectors shall be mounted as required for detection of the particles of combustion at the installed location without causing nuisance activation. Duct detectors shall be listed and labeled for duct installation and shall have an integral filter system Detectors shall be provided with an approved duct housing mounted exterior to the duct, and shall have perforated sampling tubes extending across the full width of the duct (wall to wall). Duct detectors whose operation requires the heads to be mounted inside of ducts are not acceptable.

Smoke detector shall be furnished with a remote panel mounted in a normally occupied area which shall provide a visual and an audible signal upon detector activation and shall provide a visual or an audible signal upon identification of air duct detector trouble.

M. Programmable Temperature/Time Controls - Shall be equal to Honeywell Series TH8321WF VisionPRO 8000 with Wi-Fi programmable commercial thermostats and shall have the following minimum operating capabilities:
   a. Control up to three heating and two cooling stages for gas heat, electric heat, heat pump or compressor cooling.
   b. Permit 365-day programming with schedule copy.
   c. Provide 365-day clock with automatic daylight savings changeover and up to 10 holidays.
   d. Provide 48-hour clock backup.
   e. Provide two occupied and two unoccupied periods per day.
   f. Offer automatic heat/cool changeover with 5°F minimum deadband.
   g. Provide override capability for a 1 to 8 hour configurable period, with 3-hour default.
   h. Include a comfort adjust feature to modify setpoints for the override duration.
   i. Provide configurable Proportional plus Integral plus Derivative (P + I + D) temperature control.
   j. Display room temperature in °F or °C.
   k. Provide three levels of keypad lockout - none, overrides only and complete.
   l. Provide Temporary Not Occupied Override, 1-99 days.
   m. Provide keypad method for saving and restoring both user and factory default settings.
   n. Provide five methods for dehumidification (cooling droop minimum ON time, reheat, reset temp setpoint, hot gas bypass and simple dehumidification.
   o. Provide separate configurable recovery ramps for heating and cooling.

N. CO and NO_2 Detention System - The CO and NO_2 detention system shall provide CO and NO_2 detection and automatic exhaust fan control where the potential for Carbon Monoxide and/or Nitrogen Dioxide gas exists. The CO and NO_2 detention system shall meet the requirements of the International Building Code for enclosed garages and meets OSHA standards for CO and NO_2 exposure. The system shall be stand alone and contain combination CO and NO_2 detectors/transducers with built-in fan control and alarm relays and a remote alarm horn and strobe.

The combination CO and NO_2 detectors/transducers with built-in fan control and alarm relays shall be equal to Macurco Series CX-12 Carbon Monoxide & Nitrogen Dioxide Combination Detector, Controller and Transducer. The combination detector, controller and transducer shall have low-level meter capable of displaying in the range 0-200 ppm (parts per million) of Carbon Monoxide and 0-20 ppm of Nitrogen Dioxide. The combination detector, controller and transducer shall have selectable 4-20 mA output, buzzer and digital display options. The combination detector, controller and transducer shall be factory calibrated and 100% tested for proper operation, but can also be calibrated in the field. The combination detector, controller and transducer shall be ETL LISTED Certified to CSA C22.2 No 61010-1, conforming to UL Std. 61010-1.

The alarm horn and strobe shall be equal to Macurco Series HS-R and shall have flexible optic design to meet or exceed the light output on vertical/horizontal dispersion. The strobe candela shall be adjustable at 15, 30, 75 or 110cd and have 1 flash per second flash rate. The horn shall have adjustable two audible tone settings: Continuous (high/low) or Temporal 4 (high/low). The alarm horn and strobe shall be 24 VDC and be activated by the combination detector, controller and transducer through an alarm control panel with 120VAC to 24 VDC transformer and alarm control relay.

O. Sequence of Operation -
   1. Split System Heat Pumps -The heating and cooling setpoints shall be individually adjustable for both the occupied, unoccupied and standby periods. The thermostat shall have a minimum deadband of 5°F (no mechanical heating or cooling shall operate within this deadband). Space temperature deviation above the cooling setpoint or below the heating setpoint shall generate a demand signal to control the system as follows:
      A. **Heating:** The thermostat shall control the heating output based on the demand signal communicated from the thermostat program, taking into account both space temperature deviation (proportional gain), the duration of that temperature deviation (integral gain), and the rate of change of the deviation (derivative gain). The thermostat shall energize heating equipment when space temperature falls below heating setpoint.
      B. **Cooling:** The thermostat shall control the cooling output based on the demand signal communicated from the thermostat program, taking into account both space temperature deviation (proportional gain), the duration of that temperature deviation (integral gain), and the rate of change of the deviation (derivative gain). The thermostat shall energize cooling equipment when space temperature exceeds cooling setpoint.
      C. **Dehumidification:** The thermostat shall provide one of the two methods for dehumidification as required by the equipment manufacturer:
         a. Minimum On - Increasing the compressor minimum on time.
         b. Reset - lower the cooling setpoint.

D. **Heating Setback and Cooling Setup:** Initiation of heating setback or cooling setup for each of 7 or 365 days shall be provided by a programmed time schedule manually entered into the thermostat. When all or a portion of a manually programmed schedule is unavailable, the thermostat shall control to the default program.

E. **Setpoint Recovery from Not Occupied to Occupied:** The thermostat shall incorporate a ramping feature that gradually changes the space setpoints. During recovery operation, the setpoint changes at a rate in degrees per hour depending on the outdoor air temperature. If there is no outdoor air temperature sensor available, the minimum ramp rate is used. A PDA can be used to individually adjust ramp rates for heating and cooling.

F. **Fan Operation:** Fan operation shall be selectable as follows:
   a. On: Fan operates continuously in occupied mode, and during standby modes, and during a call for heat or cool.
   b. Auto: Fan is energized with calls for heating and cooling.

G. **Minimum Stage Operation Time:**
   a. Minimum On: Heat - 1 minute; Cool - 3 minutes.
   b. Minimum Off: Cool & Heat Pump - 1 minute.

H. **Power Interruption:**
   a. On loss of power, the thermostat shall maintain programmed times and temperatures for 10 years.
   b. Clock and day information shall be retained for a minimum of 48 hours.

I. **Overrides:**
   a. The Temporary Occupied Override can be used when the thermostat is in Not Occupied or Standby mode. It shall switch to the Occupied mode for an installer-configured number of hours. The default shall be three hours.
   b. The Temporary Not Occupied Override shall fix the schedule to operate in Not Occupied mode for a number of days (between 1 and 99) without changing programming saved in memory.
   c. Pressing “Run Schedule” shall cancel the overrides and return to the program.

J. **Motorized Outside Air Damper:** Motorized outside air damper shall open to minimum position to provide the scheduled minimum outside air volume when the system is in the “Occupied” mode. Outside air damper positions shall be set in coordination with the testing and balancing of the systems.

K. **Smoke Detector:** Smoke detector, furnished and installed in the supply air duct by this contractor, shall stop unit should smoke be detected.

2. Exhaust Fans - Shall be interlocked as indicated on the plans.

3. Wall Mounted Exhaust Fan (WEF-1) and the CO and NO_2 Detention System - Each wall mounted exhaust fan shall be provided with a wall mounted “Hand-Auto” station. When an operator selected “Hand-Auto” station is placed in the “HAND” position, the motorized dampers on both wall intake louvers (LV-2 & LV-3) shall open and the selected fan shall be energized when the motorized dampers reach the fully open position. When either or both “Hand-Auto” is in the “AUTO” position, the CO and NO_2 Detention System shall control the ventilation system as follows:

   First Alarm Level - When a low level of CO (25 ppm) or/and NO_2 (1 ppm) has been detected, the CO and NO_2 Detention System shall open both motorized dampers and energize both wall mounted exhaust fans. The ventilation system shall operate until the CO and NO_2 falls to an acceptable level.

Second Alarm Level - When a high level of CO (200 ppm) or/and NO_2 (5 ppm) has been detected, the CO and NO_2 Detention System shall activate the alarm horn and strobe and the building should be evacuated.

4. Gas-Fired Radiant Heaters (GIH) - Shall be controlled by wall mounted thermostat having "Off-Auto" system selector system. Provide a hinged, locking metal thermostat guard for each thermostat.

3.9 CONTAMINATION PREVENTION

A. Equipment - Inlets and outlets of all mechanical equipment shall remain sealed until final duct connections are made.

B. Temporary Operation of Mechanical Equipment - Any mechanical equipment that is required to run for any reason during the construction must have all return air openings completely covered by MERV 8 filter media.

END OF SECTION 230100

Section 260500 - General Requirements

I. General

A. Furnish and install labor and materials required to complete the electrical work indicated on drawings and specified. Where the word "install" is used, it shall mean to furnish and install the equipment. Where the word “furnish” is used, it shall mean to furnish and install the equipment.

B. Install fire stopping material at penetrations through fire rated structures and draft stops.

C. Work shall be in accordance with the National Electrical Code, and the rules and regulations of the local bodies having jurisdiction. NEC and local ordinances and regulations shall govern unless more stringent requirements are specified.

D. Material and equipment shall be new, meet standards of NEMA or UL, and bear their label wherever standards have been established and label service is available.

E. Drawings indicate diagrammatically extent, general character and approximate location of work. Where work is indicated but with minor details omitted, install it complete to perform its intended functions. For building details and mechanical equipment, follow architectural and mechanical drawings, and fit electrical work thereto.

F. Visit the site and determine conditions that affect this contract. Failure to do so will in no way relieve contractor of his responsibility under this contract.

G. Connect electrical equipment mentioned in specifications or noted on drawings.

H. Coordinate services with any affected utilities and coordinate with the owner.

I. Procure and pay for permits and certificates as required by local and state ordinances and Fire Underwriters certificate of inspection.

J. One complete set of electrical drawings shall be reserved for as built drawings. Any approved deviation from the contract drawings shall be recorded on these drawings. Drawings shall be checked monthly for completeness. Complete as built drawings shall be presented to the architect prior to final inspection.

K. Service to building is as shown on plans. Verify with utility company prior to ordering any material or beginning work.

L. Balance load as equally as practical on service and feeders, circuits, and panel busses.

M. Cooperate with other crafts and schedule work as needed. Do not delay other trades. Maintain necessary competent mechanics and supervision to provide an orderly progression of the work.

N. Check the corresponding mechanical sheets and be responsible for including proper service and connections to mechanical items shown thereon regardless of its being or not being shown on the electrical sheets.

O. Verify exact location of motors and equipment before roughing in.

P. Install motor starters and variable frequency drives furnished by others. Make power wiring connections to starters and motors. Provide empty conduit for control wiring only to the extent shown on the electrical drawings. Control wiring

and overload heater elements for starters will be furnished and installed under other sections of these specifications.

Q. Take finish dimensions at job in preference to scale dimensions.

R. The drawings and specifications are complimentary. Information shown on the drawings but not described in the specifications or information described in the specifications but not shown on the drawings shall be considered within the scope of work. In the event of a conflict between the drawings and specifications, the contractor shall get clarification before that work is installed. No exceptions will be granted for a lack of coordination.

S. Where demolition work takes place the contractor is responsible for identifying any circuits that may be cut during the process and splice them back if they must continue on down the line so as not to interrupt other devices not being removed.

End of Section

Section 260533 - Raceways

I. General

A. Raceways and Fittings

II. Products

A. Acceptable Manufacturers
   1. Allied Tube and Conduit Co
   2. Wheatland Tube Co
   3. Republic Steel Corp.
   4. Seal-Tite
   5. Carlon
   6. Can-Tex
   7. Carol

B. Conduit: 1/2 inch unless indicated otherwise and use restricted as indicated by product.

C. Galvanized rigid steel or galvanized intermediate metal conduit is allowed for use in all areas.

D. Galvanized electrical metallic tubing (EMT) may be used in indoor dry locations where it is not subject to damage, not in contact with earth and not in concrete slabs on grade.

E. Schedule 40 polyvinyl chloride (PVC) may be used underground or in or below concrete with galvanized rigid steel or IMC elbows and risers.

F. Flexible steel conduit
   1. 1/2 inch minimum
   2. Required for final equipment, length not to exceed 36 inches
   3. Use in indoor dry locations
   4. In accessible ceilings not to exceed 72 inches
   5. Where concealed in walls and inaccessible floors and ceilings

G. Listed, Liquidtight flexible metal conduit shall be used in outdoor final connections to mechanical equipment, length not to exceed 36 inches.

H. Prewired 3/8 inch Flexible Fixture
   1. Whips allowed only for connection to recessed lighting fixtures
   2. Lengths not to exceed 72”

I. Prohibited Raceway Materials
   1. Aluminum Conduit
   2. Electrical Nonmetallic Tubing (ENT) Conduit
   3. Armored cable type AC (BX) cable.

J. Fittings For
   1. Rigid Steel Conduit and IMC- Threaded and designed for conduit use.
   2. EMT
      a) Steel Compression Type
      b) Steel set screw housing type
   3. PVC Conduit

a) Use PVC adapters at all boxes.
b) PVC components, (conduit, fittings, cement) shall be from same manufacturer.

4. Flexible Steel Conduit- Screw-in type
5. Liquidtight Flexible Metal Conduit- Seallite type
6. Prohibited Fitting Materials
   a) Crimp-on, tap-on, indenter type fittings
   b) Cast set-screw fittings for EMT
   c) Spray (aerosol) PVC cement.

K. Modular wiring systems may be used for branch circuiting for lighting and receptacle circuits. Acceptable manufacturers are Cooper MWS and Lithonia Reloc.

L. Sleeves through rated walls
1. Sleeves shall be EMT conduit of the size shown on plans (2" or 4").
2. Fittings shall be Wiremold FlameStopper FS2R-GA or FS4R-GA. Install fitting on each end of sleeve.
3. Sleeve installation shall have an "F" rating of a minimum of 3 hours with or without cables.
4. Use proper size heat shield FS2RHS or FS$RHS when conduit extends more than 1" beyond the wall surface.
5. See Wiremold FlameStopper web site for installation instructions.

III. Installation

A. Conceal raceways within ceilings, walls, and floors, conduit may be exposed on walls or ceilings of mechanical equipment areas and above acoustical panel suspension ceiling systems. Install exposed raceway runs parallel to or at right angles to building structure lines. Keep raceway runs 6 inches minimum from hot water pipes, flues, steam pipes and heat sources

B. Install conduit in accordance with NECA "Standard of Installation."

C. Securely support raceway within 3 feet of every outlet box, junction box, device box, cabinet, conduit body, and other termination with approved straps, clamps, or hangers. Space supports every 10 feet maximum. Securely mount raceway supports, boxes, and cabinets in an approved manner by
1. Expansion shields in concrete or solid masonry
2. Toggle bolts on hollow masonry units
3. Wood screws on wood
4. Metal screws on metal

D. Do not install raceway larger than one inch in concrete slabs. Install raceway in concrete slabs at center of slab. Raceways shall have outside diameter of less than 1/3 slab thickness.

E. Install raceway free from dents and bruises. Cover ends to prevent entry of dirt or moisture during construction.

F. Clean or replace raceway, in which water or foreign matter have accumulated.

G. Alter raceways routing to avoid structural obstructions, minimizing crossovers.

H. Seal raceways with oakum glass fiber where conduits leave heated area and enter unheated area.

I. Install UL approved expansion fittings complete with grounding jumpers where conduits cross building expansion joints. Install bends or offsets in conduit adjacent to building expansion joints where conduit is installed above suspended ceilings.

J. Route exposed conduits parallel and perpendicular to building lines.

K. Trapeze, split ring, band or clevis hanger may be installed as permitted by the NEC. Trapeze hangers shall be structural metal channels, angle irons or preformed metal channel shapes with the conduit and EMT runs held on specific center by U bolts, clips or clamps. Chain, wire or perforated strap supports will not be acceptable.

L. Install grounding conductor in PVC conduit.

M. Bending of PVC shall be by hot box bender and, for PVC 2 inches in diameter and larger, expanding plugs. Apply PVC adhesive by brush.

N. Prohibited Procedures
   1. Use wood plugs inserted in concrete or masonry units for mounting raceways, supports, boxes, cabinets, or other equipment.
   2. Installation of raceway which has been crushed or deformed
   3. Use of torches for bending PVC
   4. Spray applied PVC cement
   5. Boring holes in truss members
   6. Notching of structural members
   7. Supporting raceway from ceiling support wires
   8. Nail drive straps for supporting raceways.

O. Plastic conduit shall not be exposed; switch to rigid steel conduit before turning up into exposed areas. Turn-ups into permanent wall spaces will not be considered exposed. Other conduit, unless otherwise specified or called for on the plans, shall be rigid metal conduit, intermediate metal conduit, or EMT.

P. Raceways 1 1/4 inches in diameter and larger shall have grounding bushings on each end.

Q. Do not bore holes in floor or ceiling joists outside center third of member depth or within 2 feet of bearing points. Holes shall be one inch diameter maximum.

R. Install bushing on end of raceway stubbed out above ceiling.

S. Conduit installed underground shall be a minimum of 2'-0" to top of conduit below grade. This applies to lighting, power and auxiliary conduit.

T. Conduit installed beyond the perimeter of the building shall be encased in 2 inches of concrete all around.

U. Install #16 AWG pull wire in all empty conduits.

V. Paint surface mounted conduit to match surface it is mounted on.

W. Record actual routing of conduits larger than 2”.

X. Install color bands one inch wide for conduits up to two inches in diameter and one-half the conduit diameter for larger conduits, applied at panel and pullbox locations, within each room, and 50 ft. on centers within an area.

120/208 Volt	Gray
277/480 Volt	Orange
Fire Alarm	Red
Intercom	Brown
CCTV Security	Black
Burglar Alarm	Magenta
Telephone and Data	Blue
AV	Yellow

Y. Install conduit to preserve fire resistance rating of partitions and other elements. Seal penetrations with Flame-Safe FS900 series firestop compounds as manufactured by International Protective Coatings Corporation (800-334-8796). Verification of these requirements shall be the responsibility of this contractor.

Z. Route conduit through roof openings for piping and ductwork or through “PCA” series roof curb as manufactured by Pate. Pitch pockets are unacceptable. This contractor shall provide curbs where required to roofing contractor for installation and coordination of installed locations.

End of Section

Section 260600-Electrical Submittals

I. General

A. Provide printed submittals on the items as listed.

II. Products

A. Within twenty (20) days after award of contract, submit one original set and 5 printed copies of Manufacturer's drawings to Architect for review of the following systems that are applicable to this project:
   1. Panelboards
   2. Switchboards
   3. Transformers
   4. Floor Outlets
   5. Disconnect Switches
   6. Lighting Fixtures
   7. AV System
   8. Intercom System
   9. CCTV System if applicable
   10. Not Used
   11. Not Used
   12. Lighting Control System
   13. Data Cabling System
   14. Fire Alarm System
   15. Wiremold Flamestopper System

B. Submittals shall be electronic PDF files.

C. A submittal that has been reviewed and approved does not remove liability from the contractor to meet the requirements of the contract documents.

End of Section

Section 260800 - Equipment Identification

I. General

A. Provide identification information on designated electrical equipment.

II. Products

A. Laminated plastic plates with 3/16" high white letters engraved on black background.
B. Painted, stenciled, or indented tape identification is not acceptable.

III. Installation

A. Each electrical apparatus such as wireway, panelboards, single enclosed circuit breakers, each circuit breaker in a switchboard, transformers, and disconnecting switches shall have engraved-laminate plastic identification plates. Identification shall identify the equipment served and circuit and panel from which it is served. Equipment shall be identified by designation used on electrical and mechanical drawings. Label shall be similar to that shown.
B. A steel circuit directory frame, a directory card, and a plastic card overlay shall be provided on the inside of each panelboard door. The directory shall be typewritten to identify the load fed by each circuit and the areas served. Spaces or room numbers shown on the drawings are not final. The contractor shall, before completion of the project, obtain from the architect final space or room numbers and type these on the directories.
C. Identification plates shall be permanently mounted utilizing pop rivets or screws. Mounting by adhesive is prohibited.
D. Provide laminated labels (similar to Brother p-Touch) on each receptacle faceplate indicating the panel and the circuit number feeding the receptacle. Labels shall be black writing on clear tape.

End of Section

Section 260900 - Construction Reviews and Testing

I. General

A. The architect or his representative shall observe and review the installation of all electrical systems shown on the drawings and as specified herein.

II. Products

A. (This section not applicable)

III. Installation

A. At the time of the contractor's final inspection, all systems shall be checked and tested for proper installation and operation by the contractor in the presence of the architect or his representative.

B. The contractor shall furnish the personnel, tools, and equipment required to inspect and test all systems.

C. Following is a list of items that the contractor must demonstrate to the architect or his representative as complying with the plans and specifications. Note that this list is representative and does not include all items covered in the final inspection.

D. Demonstrate that disconnects requiring fuses are fused with the proper size and type, and that disconnects are properly identified.

E. Demonstrate that each extended auxiliary system is in perfect working order according to the intent of the plans and specifications.

F. Demonstrate that panels have breakers as specified, grounding bus, copper busing, typed directory, and that they are free of trash.

G. Demonstrate that conduits are supported as required by the National Electrical Code.

H. Demonstrate that outlets boxes above or on the ceiling are supported as required by the National Electrical Code.

I. Demonstrate that outlets boxes in walls or ceilings of combustible material are flush with surface of wall or ceiling, and that outlet boxes in walls or ceilings of non-combustible materials are so installed that the front edge of the box or plaster ring is not set back more that 1/4".

J. Demonstrate that outlet boxes in walls are secure.

K. Demonstrate that devices are properly secured to boxes, that device plates are properly aligned and are not being used to secure device.

L. Utilizing a Woodhead No. 1750 testing device, demonstrate that all 125 volt receptacles are properly connected.

M. Demonstrate that fixtures have proper lamping/lenses, and that they are supported as required by the National Electrical Code or as called for on the drawings or in the specifications.

N. Service grounding: show connection to ground rods and cold water main (if metallic).

O. Demonstrate that service main and separately derived systems are properly bonded.

End of Section

Section 262000 - Wire and Cable

I. General

A. This section includes the furnishing, installation, and connection of the low voltage power and lighting wiring.

B. The contractor has the responsibility to determine if any plenum areas exist in this project and provide plenum rated cable if necessary.

II. Products

A. Acceptable Manufacturers
1. General Electric
2. Okonite
3. Senator
4. Triangle
5. Anaconda
6. Cyprus Rome
7. Phelps Dodge
8. Carol
9. Southwire

B. Single Conductor Cable and Wire
1. Annealed Copper
2. Stranded for sizes no. 8 and larger. Solid for sizes No. 10 and smaller
3. Minimum size No. 12, except where larger sizes are shown.
4. Insulation:
   a) THW, XHHW, or dual rated THHN /THWN, UL 44, 83, and 493.

C. Color Code
1. Secondary service, feeder, and branch circuit conductors shall be colored coded as follows:

	208V	480V
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	Phase A white w/black stripe, Phase B white w/red stripe, Phase C, white w/blue stripe	Phase A gray w/brown stripe, Phase B gray w/orange stripe, Phase C gray w/yellow stripe
Grounding	Green	Green w/Yellow Stripe

   a) If single circuit MC cable is used, standard color coding shall be used. Multi-circuit MC cable shall be permitted with written permission by the engineer before the bid.
2. Use solid color compound or solid color coatings for No. 12 and No. 10 branch circuit conductors and neutral sizes.
3. Phase conductors No. 8 and larger color code using one of the following:
   a) Solid color compound or solid color coating.

b) Stripes, bands, or hash marks of color specified above.
c) Colored as specified using 3/4" wide tape. Apply tape in half overlapping turns for a minimum of three inches for terminal points, and in junction boxes, pull boxes, troughs, manholes, and handholes. Apply the last two laps of tape with no tension to prevent possible unwinding. Where cable markings are covered by tape, apply tags to cable stating size and insulation type.

D. Splices and Joints
1. In accordance with UL 486A, B, D, and NEC.
2. Branch circuits (No. 10 and smaller):
a) Connectors: Solderless, screw on, reusable cable type, 600 volt, 105 degree C. with integral insulation, approved for copper and aluminum conductors.
b) The integral insulator shall have a skirt to completely cover the stripped wires.
c) The number, size, and combination of conductors, as listed on the manufacturer's packaging shall strictly be complied with.
3. Feeder Circuits
a) Connectors shall be indent, hex screw, or bolt clamp-type of high conductivity and corrosion-resistant material.
b) Field installed compression connectors for cable sizes 250 kc mil and larger shall have not less than two clamping elements or compression indents per wire.
c) Insulate splices and joints with materials for the particular use, location, voltage, and temperature. Insulate with not less than that of the conductor level that is being joined.

E. Plastic electrical insulating tape: flame retardant, cold and weather resistant.

F. Wire Lubricating Compound
1. Suitable for the wire insulation and conduit it is used with, and shall not harden or become adhesive.
2. Shall not be used on wire for isolated type electrical power systems.

G. Fire Proofing Tape
1. The tape shall consist of a flexible, conformable fabric of organic composition coated one side with flame-retardant elastomers.
2. The tape shall be self-extinguishing and shall not support combustion. It shall be arcproof and fireproof.
3. The tape shall not deteriorate when subjected to water, gases, salt water, sewage, or fungus and be resistant to sunlight and ultra violet light.
4. The finished application shall withstand a 200 ampere arc for not less than 30 seconds.

H. Securing tape: Glass cloth electrical tape not less than 7 mils thick.

I. Splice installation
1. Splices and terminations shall be mechanically and electrically secure.
2. Where the architect determines that unsatisfactory splices or terminations have been installed, remove the devices and install approved devices at no additional cost

J. Feeder identification
   1. In each interior, pull box and junction, install metal tags on each circuit cables and wires to clearly designate their circuit identification an voltage.
   2. In manholes and handholes, provide tags of the enclosed brass type, and also show the cable type and voltage rating. Attach the tags to the cables with slip-free plastic cable lacing units.

III. Installation

A. Conductor lengths of parallel feeders shall be identical.
B. Lace or clip groups of feeder conductors at distribution centers, pullboxes, wireways.
C. Install copper grounding conductors and straps.
D. Install wire in conduit runs after concrete and masonry work is complete and moisture is swabbed from conduits.
E. Route circuits at own discretion, however Circuit numbers and grouping of circuits in homeruns to panel shall be as shown on Drawings.
F. Install conductors of different voltage systems in separate conduits.
G. Do not install control conductors in same conduit with power conductors.
H. Do not combine homeruns into one conduit unless specifically shown on the plans. In general, each piece of HVAC and Plumbing equipment shall have a separate homerun back to the panel.
I. Install wiring in raceway systems, except where direct burial is shown.
J. Splice cables and wires only in accessible outlet boxes, junction boxes, pull boxes, manholes, or handholes.
K. Install cable supports for all vertical feeders in accordance with the NEC. Provide split wedge type which firmly clamps each individual cable and tightens due to cable weight.
L. For panelboards, cabinets, wireways, switches, and equipment assemblies, neatly form, train, and tie the cables in individual circuits.
M. Seal cable and wire entering a building from underground between the wire and conduit, where the cable exits the conduit, with a non hardening approved compound.
N. Wire Pulling:
   1. Provide installation equipment that will prevent the cutting or abrasion of insulation during pulling of cables. Do not use heavy mechanical means for pulling conductors.
   2. Use ropes for pulling feeders made of non-metallic material.
   3. Attach pulling lines for feeders by means of either woven basket grips or pulling eyes attached directly to the conductors.
   4. Pull in together multiple cables in a single conduit.
O. Common neutrals shall not be acceptable.

End of Section

Section 262700 - Pull and Junction Boxes

I. General

A. Pullboxes
B. Junction boxes

II. Products

A. Acceptable Manufacturers
   1. Raco
   2. Steel City
   3. Appleton
   4. Hubbell
B. Materials
   1. Pullboxes and Junction Boxes: Metal construction, conforming to National Electrical Code, with screw-on or hinged cover.
   2. Flush Mounted Pullboxes: Install overlapping covers with flush-head cover retaining screws, prime coated.

III. Installation

A. Install pullboxes and junction boxes above removable ceilings or in electrical rooms, utility rooms, or storage areas.
B. Boxes shall be provided in the wiring of raceway systems whenever required for the pulling of wires and the making of connections.
C. Pull boxes of not less than the minimum size required by the NEC Article 370 shall be constructed of code gauge galvanized sheet steel. Boxes shall be furnished with screw-fastened covers. Boxes located on the exterior of the building shall be watertight.
D. Boxes shall be securely and rigidly fastened to the surface upon which they are mounted or shall be supported from structural member of the building either directly or by using a substantial and approved metal rod or brace.
E. Boxes shall be installed so that the wiring contained in them can be rendered accessible without removing part of the building.
F. Where several circuits pass through a common pull box, the circuits shall be tagged to indicate clearly their electrical characteristics, circuit number and designation.

End of Section

Section 262900 - Devices

I. General

A. Work Included
1. Outlet Boxes
2. Wall Switches
3. Receptacles
4. Plate Covers

II. Products

A. Outlet Boxes
1. Steel boxes shall be hot dip galvanized, 1.25 oz/ sq. ft. or cadmium and conform to UL requirements.
2. Interior boxes shall be pressed sheet steel, blanked for conduit. Provide attached lugs for locating.
3. Ceiling mounted boxes shall be 4 inch octagonal box for receiving 4 or fewer 1/2 in conduits
4. Flush mounted boxes in walls shall have matching plaster cover for single or two gang outlets. For larger boxes, use solid type or special units in masonry, use deep boxes.
5. Install metal supports and other accessories for secure installation of each box.
6. Equip with extensions to bring box flush with finish surface.
7. Surface mounted boxes, in mechanical, electrical, and storage rooms, shall be 4 inch square, stamped steel boxes with conduit knockouts. In areas other than mechanical, electrical and storage rooms, use exterior boxes as specified below.
8. Exterior boxes shall be die cast aluminum, threaded for conduit openings, deep type Perfect-Line TD-11-2 or equal. Install closure plugs in unused conduit openings.

B. Wall Switches
1. Acceptable manufacturers are Hubbell, Pass & Seymore, Bryant, Eagle, Arrow-Hart and Leviton.
2. 120/277 volt switches shall be quiet slow make, slow break design, toggle handle, with totally enclosed case rated 20 ampere, specification grade. Install matching 2 pole, 3 way, and 4 way switches. See symbol schedule.
3. Color shall be gray switches with stainless steel plates for normal power.

C. Receptacles
1. Acceptable manufacturers are Hubbell, Pass & Seymore, Eagle, Bryant, Arrow-Hart and Leviton.

2. Standard duplex receptacles shall be full gang size, polarized, duplex, parallel blade, U-grounding slot, specification grade, rated at 20 ampere, 125/277 volts, designed for split feed service. See symbol schedule.
3. Color shall be gray receptacles with stainless steel plates for normal power. For special controlled outlets see plans for color reference.

D. Plate Covers
1. Acceptable manufacturers are Hubbell, Perfect-Line, Pass & Seymore, Arrow-Hart, Bryant, Leviton and Slater.
2. Steel Plate Covers shall be hot dip galvanized, 1.25 oz/sq ft minimum.
3. Stainless steel plate covers shall be type 302 or 304, 0.040" thick, No. 4 finish, accurately die cut, smooth rolled outer edge and protected with release paper.
4. Cast metal plate covers shall be die cast profile, ribbed for strength, flash removed, primed with gray enamel and furnished with four mounting screws.
5. Crackle finish plate covers shall be steel, finished paint, color to match device.
6. Gaskets shall be resilient rubber or closed cell foam urethane.
7. Flush mounting plates shall be stainless steel for normal power, plastic for emergency power.
8. Surface box plate covers in mechanical, electrical and storage rooms shall be galvanized, stamped steel, smooth rolled edge to match box. In areas other than mechanical, electrical, and storage rooms, plate covers shall be stainless steel, smooth rolled edge to match box.
9. Weatherproof plate covers shall be non-metallic high impact polycarbonate, 1 gang, vertical, duplex or GFCI/Style Line Device, Hubbell WP826MP. 1 gang horizontal weatherproof covers shall be duplex or GFCI/Style Line device, Hubbell WP826MHP.
10. See receptacle and switch specifications for color of cover plates.

III. Installation

A. Outlet boxes
1. Adjust position of outlet boxes in finished masonry walls to suit masonry course lines.
2. Do not locate device boxes on opposite sides of framed walls in the stud space. In other wall construction, do not install boxes back to back. A minimum of 4" shall separate each outlet. Coordinate cutting of masonry walls to achieve neat openings for boxes. Use rotary cutting equipment to cut masonry work for installation of electrical fittings.
3. Do not use sectional or handy boxes unless specifically shown on the drawings.
4. Install insulation behind boxes mounted in exterior walls to prevent condensation in boxes.

5. For outlets mounted above counters, benches and splash backs, coordinate location and mounting height to built-in units. Adjust outlet mounting height to agree with required location for equipment services.
6. Coordinate location of outlet for water cooler with Division 15.
7. Boxes shall be accessible and installed with approved cover.
8. Install outlets flush with finished surface and level and plumb.
9. Boxes for switches shall generally be located within 6 inches of door jamb.
10. Switch boxes larger than two-gang shall be supported with side brackets and steel bar hangers in framed walls.

B. Wall Switches
1. Install switches 40 inches to bottom above floor.
2. In masonry, install switch where bottom or top of device box coincides with a block coursing.
3. Coordinate switch mounting location with architectural detail. Adjust mounting location in reference to door jamb such that switches avoid cabinet work.

C. Receptacles
1. Install receptacles vertically at 16 inches to bottom above finished floor with grounding pole at top.
2. In masonry, install receptacle where bottom or top of device box coincides with a block coursing.
3. In kitchen and other areas, coordinate receptacle height with benches and counters.
4. When mounting height exceeds 27” inches above floor, install horizontally with grounding pole at left.
5. Install cord and plug to match receptacles other than 20 amp 1 pole receptacles.
6. Do not cascade convenience receptacles on the “load” side of GFCI devices unless specifically noted.

D. Plate Covers
1. Install plate covers on wiring devices.
2. Plates in other than masonry walls shall be standard size. Plates in masonry walls shall be oversized jumbo type.
3. Install devices flush with walls, straight, and solid to box.
4. Install blank covers over unused recessed device boxes..

End of Section

Section 262920 - Panelboards

I. General

A. Install circuit breaker lighting panelboards as indicated in the panelboard schedule and where shown on the drawings.
B. Install distribution and power panelboards as indicated in the panelboard schedule and where shown on the plans.

II. Products

A. Acceptable Manufacturer's
    1. Square "D"
    2. GE
    3. Cutler Hammer
    4. Siemens
B. Lighting Panelboards
    1. Panelboards shall be of a dead-front safety type equipped with thermal magnetic molded case circuit breakers with frame and trip ratings as shown on the schedule.
    2. Circuit breakers shall be quick-make, quick-break, thermal magnetic, trip indicating and have common trip on all multiple breakers. Automatic tripping shall be clearly shown on the breaker handle taking position between On and Off when the breaker is tripped. Connection to the bus shall be bolt on.
    3. Bus bar connections to the branch circuit breakers shall be the "distributed phase" or "phase sequence" type. Single-phase, three-wire panelboard bussing shall be such that any two adjacent single-pole breakers can be installed in any location. Three-phase, four-wire bussing shall be such that any three adjacent single-pole breakers are individually connected to each of the three different phases in such a manner that two or three-pole breakers can be installed at any location. All current carrying parts of the bus assembly shall be plated copper. Main ratings shall be shown in the panelboard schedule on the plans.
    4. Terminal for feeder conductors to the panelboard mains and neutral shall be UL listed as suitable for the type of conductor specified. Terminals for branch circuit wiring, both breaker and neutral, shall be UL listed as suitable for the type conductor specified.
    5. Arrange breakers as follows: Beginning at top left with lowest to highest trip, install single pole, two pole, and three pole, fill left row then begin right. Circuits to be numbered vertically beginning with top left. The panel shall have engraved plastic plate on front of panel with panel name and rating. Plates shall be screw fastened.
    6. The panelboard bus assembly shall be enclosed in a steel cabinet. The size of the wiring gutters and gauge of steel shall be in accordance with NEMA

and UL standards for panelboards. The box shall be fabricated from galvanized steel or equivalent rust-resistant steel.

7. Front shall have door in door construction and have flush, brushed stainless steel, cylinder tumbler-type lock with catches and spring-loaded door pulls. The flush lock shall be keyed alike. Fronts shall not be removable with door in the locked position. A circuit directory frame and card with a clear plastic covering shall be provided on the inside of the door. The directory shall be typed to identify the load fed by each circuit. Fronts shall be of code gauge, full finished steel with rust inhibiting primer and baked-enamel finish.
8. Each panelboard, as a complete unit, shall have a short circuit current rating equal to or greater than the integrated equipment rating shown on the panelboard schedule or on the plans. This rating shall be established by testing with the over current devices mounted in the panelboard. Method of testing shall be per UL Standard UL 67. Panelboards shall be marked with their maximum short circuit current rating at the supply voltage.
    a) Series ratings with line side breakers shall be acceptable to meet the short circuit rating.
9. Panelboards shall be listed by Underwriters Laboratories and bear the UL label. When required, panelboards shall be suitable for use as service equipment. Panelboards shall be of the following type:

Manufacturer	120/208 V	277/480 V
Square D	NQ	NF

10. Panelboards shall be from the same manufacturer.

III. Installation

A. Install panels as recommended by manufacturer and as required by Code.
B. Panels shall be mounted flush or surface as indicated on drawings.
C. Panelboards shall be stored in a dry, out of the weather location until installed. Do not install in building until the location of the panelboard is dry and not susceptible to moisture. This includes interiors and enclosures.
D. Panels shall have all listings related to ARC Flash that are required by the NEC.

End of Section

Section 262930 - Motor and Circuit Disconnects

I. General

A. Install motor disconnects
B. Provide disconnects with current limiting fuses where equipment requires a lower AIC protection.

II. Products

A. Acceptable Manufacturer's
   1. Square "D"
   2. GE
   3. Cutler Hammer
   4. Siemens
B. Motor and circuit disconnects shall have Underwriters' Laboratory label.
C. Three Phase Motor Disconnect Switches: 3 pole heavy duty, fusible - unless otherwise indicated, 250 or 600 volt as required in NEMA enclosures as required.
D. Thermal overload protection to be provided single phase motors by manual switches with overload units rated as required by specific motor to be served. Manual motor starters shall be equal to Square D Class 2510 fractional horsepower manual starters with melting alloy type thermal overload relay.

III. Installation

A. Install motor and circuit disconnect as recommended by manufacturer and as required by Code.
B. Exterior disconnects shall have NEMA-3R raintight enclosures.
C. Disconnects shall be equipped with provisions to lock the handle in the on or the off position.
D. Disconnects, panelboards and switchboards shall be manufactured by the same manufacturer.
E. Do not install disconnects on equipment it serves. Disconnects shall be mounted on separate support from equipment. Disconnects mounted on equipment will not be approved.

End of Section

Section 262940 - Grounding

I. General

A. Install complete grounding system in accordance with National Electrical Code and as shown on drawings.

II. Products

A. See Conduit
B. See Wires and Cables

III. Installation

A. Grounding Electrode Conductor shall be sized as shown on the drawings and shall be connected to
   1. A minimum of three (3) driven ground rods
   2. Building Steel
   3. Incoming cold water line, if metal
   4. An electrode encased by at least 50 mm (2 in.) of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth, consisting of at least 6.0 m (20 ft) of one or more bare or zinc galvanized or other electrically conductive coated steel reinforcing bars or rods of not less than 13 mm (1/ 2 in.) in diameter, or consisting of at least 6.0 m (20 ft) of bare copper conductor not smaller than 4 AWG. Reinforcing bars shall be permitted to be bonded together by the usual steel tie wires or other effective means.

B. Ground rods shall be 3/4" copperweld rods 10'-0" in length. Top of ground rods shall be twelve inches below finished grade. Connections to ground rods shall be made by chemical weld process. Resistance to ground shall not exceed twenty-five ohms. Not more than three ground rods shall be required and these shall be spaced not less than three feet apart.

C. Upon completion of the ground rod installation, the contractor shall record the grounding reading. Ground resistance readings shall not be taken within 48 hours of rainfall. Results of ground resistance readings shall be forwarded, in writing, immediately to the architect.

D. Motors shall be grounded by drilling and tapping the bottom of the motor junction box and attaching the grounding conductor to the box with a round head bolt used for no other purpose. Conductor attachment shall be through the use of a lug attached to with crimping tool.

E. Non current carrying parts of electrical equipment shall be grounded. Continuity of ground shall be maintained through metallic raceway systems, and when called for through a properly sized green insulated grounding conductor. Install

properly sized green insulated grounding conductor in non metallic raceway systems.

F. Flexible conduit connections shall be supplemented with a bonding jumper installed "inside" the flexible conduit. Bonding jumpers on the outside of the flexible conduit are not acceptable. Flexible conduits less than 6' in length that serve lighting fixtures shall not require a bonding jumper.

G. Bonding and grounding bushing with nylon insulated throat and screw lugs shall be installed on all feeder conduits and conduit 1" or larger for positive bonding to enclosure.

H. Install an equipment grounding conductor in feeder circuits, branch circuits, and other circuits. This conductor shall be sized per NEC Table 250.122.

End of Section

Section 265000 - Lighting Systems

I. General

A. Install luminaries, supports, and accessories.
B. Install plaster frames, trim rings and backboxes for plaster, drywall ceilings, or concrete.

II. Products

A. Lighting Fixtures
   1. Lighting fixture manufacturers shall be as listed in the Lighting Fixture Schedule on the drawings.

III. Installation

A. Lighting Fixtures
   1. Check lighting fixtures for exact type mounting and space required before roughing in.
   2. Install recessed luminaries to permit removal from below, to gain access to outlet or prewired fixtures box.
   3. Install fixture so that power supplies are replaceable from below.
   4. Connect recessed luminaries to junction boxes with flexible conduit and fixture wire.
   5. Install plaster frames for fixtures installed in gyp board ceilings.
   6. Provide plaster frames, trim rings, and boxes to other trades.
   7. Install fixtures as shown on reflected ceiling plan. Do no install by dimensioning electrical drawings.
B. If no reflected ceiling plan is provided, verify location of lighting fixtures with architect prior to roughing in.
C. Coordinate with Division 15 to avoid conflicts between luminaries, supports, fittings, and mechanical equipment.
D. Align fixtures and clean diffusers prior to final acceptance.
E. Lighting Fixture Support
   1. Install supports for all of the lighting fixtures. Supports may be anchored to channels of the ceiling construction, to the structural slab or to structural members within a partition, or above a suspended ceiling.
   2. Supports shall maintain the fixture positions after cleaning and relamping.
   3. Lighting fixture supports the fixtures without causing the ceiling or partition to deflect.
F. Hardware for recessed fixtures:
   1. Where the suspended ceiling system is supported at the four corners of the fixture opening, hardware devices shall clamp the fixture to the ceiling system structural members, or plaster frame at not less than four points in such a manner as to resist spreading of the support members and safely lock the fixture into the ceiling system.

2. Where the suspended ceiling system is not supported at the four corners of the fixture opening, hardware devices shall independently support the fixture from the building structure at two points at opposite corners of the fixture. Use color wire as directed by state officials.
3. Hardware for surface mounting fixtures to suspended ceilings:
    a) In addition to being secured to any required outlet box, fixtures shall be bolted to a grid ceiling system at four points spaced near the corners of each fixtures. The bolts shall be not less than 1/4" secured to channel members attached to and spanning the tops of the ceiling structural grid members. No-turning studs may be attached to the ceiling structural grip members or spanning channels by special clips designed for the purpose, provided they lock into place and require simple tools for removal.
    b) In addition to being secured to any required outlet box, fixtures shall be bolted to plaster ceiling at four points spaced near the corners of each fixture. Prepositioned 1/4" toggle bolts may be used on new or existing ceiling provided the plaster and lath can safely support the fixtures without sagging or cracking.

G. Emergency battery packs shall be installed inside fixtures at factory. Field installed battery packs will not be acceptable.

End of Section

Section 270000 – Telephone/Data Raceway System

I. General

A. Install a telephone/data raceway system. The system shall include a telephone backboard, conduit, outlet plate covers, and all necessary accessories to provide a complete raceway system ready for installation of backboard equipment, wiring, outlets, and telephone sets by others. Provide all components that are applicable to this project and scope of work.

II. Products

A. Minimum of ¾" conduit shall be used for the system.
B. Outlets shall be 4" square box with single gang plaster ring.
C. Install conduit from outlet to above accessible ceiling. See symbol schedule for size of conduit.
D. Outlet plate covers shall be blank stainless steel with smooth rolled outer edge.

III. Installation

A. Not Used.
B. Place TELEPHONE/DATA label on pull and junction boxes.
C. Outlets shall be located as shown on the drawings. Install cover plate on each unused outlet. Telephone vendor (NIC) shall provide cover plates for outlets used.
D. Install outlets at 16" AFF to bottom of outlet.
E. Install raceway for concealed wiring. Wiring may be run exposed if located above accessible ceiling.
F. Not Used.

End of Section

SECTION 263213 – SPARK IGNITED ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Spark-Ignited Engine.
2. Natural Gas Fuel Supply System.
3. Control and monitoring.
4. Generator overcurrent and fault protection.
5. Generator, exciter, and voltage regulator.
6. Outdoor engine generator enclosure (where selected).
7. Vibration isolation devices (where applicable).

B. Related Requirements:

1. Section 262313 "Paralleling Low-Voltage Switchgear" for controls and paralleling equipment for large or multiple parallel engine generators.
2. Section 263343 "Battery Chargers" for remote engine battery chargers.
3. Section 263600 "Transfer Switches" for transfer switches including sensors and relays to initiate automatic-starting and -stopping signals for engine generators.

1.2 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system.

C. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the range of conditions indicated, expressed as a percentage of the nominal value of the parameter.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Include thermal damage curve for generator.
3. Include time-current characteristic curves for generator protective device.
4. Include fuel consumption in gallons per hour (liters per hour) at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.
5. Include generator efficiency at 0.8 power factor at 0.5, 0.75, and 1.0 times generator capacity.

6. Include airflow requirements for cooling and combustion air in cubic feet per minute (cubic meters per minute) at 0.8 power factor, Provide Drawings indicating requirements and limitations for location of air intake and exhausts.
7. Include generator characteristics, including, but not limited to, kilowatt rating, efficiency, reactances, and short-circuit current capability.

B. Shop Drawings:

1. Dimensioned Outline Drawings of Equipment Unit: With engine and generator mounted on rails, identify center of gravity and total weight for provided components; fuel tank, enclosure, silencer, base tank, each piece of equipment not integral to the engine generator.
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. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams indicating terminal markings for engine generators and functional relationship between all electrical components.
7. Rigging Information: Indicate location of each lifting attachment, generator-set center of gravity, and total package weight in submittal drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for engine generator, accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
2. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

B. Source Quality-Control Reports: Including, but not limited to, the following:

1. Certified summary of prototype-unit test report. Perform tests at rated load and power factor. Provide the following test results:

a. Maximum Power Level
b. Maximum Motor Starting (sKVA)
c. Structural Soundness
d. Torsional Analysis
e. Transient Response
f. Alternator Temperature Rise
g. Engine Cooling Requirements (unit mounted radiator)
h. Harmonic Analysis (per IEEE-115 and ANSI-100)
i. Voltage Regulation

j. Endurance Testing

2. Certified Test Reports: For components and accessories that are equivalent, but not identical, to those tested on prototype unit.
3. Report of factory test on units to be shipped for this Project, indicating evidence of compliance with specified requirements.
4. Report of sound generation.
5. Report of exhaust emissions indicating compliance with applicable regulations.
6. Certified Torsional Vibration Compatibility: Comply with NFPA 110.

C. Field quality-control reports. Field start up report and unit in-service documentation, including load bank test results if applicable.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For packaged engine generators to include in emergency, operation, and maintenance manuals. Include manufacturer's recommended maintenance and periodic testing plan in accordance with NFPA 110, Chapter 8.

B. Furnish extra materials required by local Authority Having Jurisdiction (AHJ) and defined in project documents that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

A. The generator set covered by these specifications shall be designed, tested, rated, assembled and installed in accordance with all applicable standards below:

1. CSA C22.2, No. 14-M91 Industrial Control Equipment.
2. CSA C22.2, No. 100 Motors and Generators
3. CSA 282-15
4. EN 61000-6
5. EN 55011
6. FCC Part 15 Subpart B
7. ISO 8528
8. IEC 61000
9. UL 508
10. UL 2200
11. UL 142
12. UL 6200
13. Designed to allow for installed compliance to NFPA 37, NFPA 70, NFPA 99 and NFPA 110

B. Manufacturer Qualifications:

1. Current certificate holder for ISO 9001 compliance.
2. The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 25 years and who maintains a service organization of

factory-authorized generator technicians available twenty-four hours a day throughout the year.

3. Manufacturing and assembly of products must be done in the United States using domestically sourced materials to the extent practical.

C. Installer Qualifications: An authorized representative who is trained and certified by the manufacturer on stationary power systems.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty: 5 Year Comprehensive from date of Substantial Completion.
2. A Comprehensive Warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for covered warranty repairs during the listed warranty period. A Limited warranty is defined as the manufacturer covering replacement parts, labor, and limited technician travel costs for the first 2 years and then replacement parts for the remainder of the listed warranty period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Generac Power Systems, Inc.; 100 kW, 14.2L with a K0150124Y21 - 100kW (520) alternator. The Single Phase generator shall be rated for 100 kW at 240 volts and 60 Hz, at 0.8 power factor lagging while operating at a maximum ambient temperature of 122 Fahrenheit and maximum altitude of 7500 feet above sea level without reduction in electrical output capacity. Comparable products by one of the following will also be considered:

1. Caterpillar, Inc.
2. Cummins Power Generation.

B. Source Limitations: Obtain packaged engine generators and auxiliary components from single source from single manufacturer. "Source Limitations: Obtain packaged engine generators and auxiliary components from single supplier. The equipment supplied and installed shall meet the requirements of NEC and all applicable local codes and regulations. All equipment shall be new, of current production. There shall be one source responsibility for warranty; parts and service through a local representative with factory certified service personnel.

C. Requests for substitutions shall be made a minimum of ten (10) days prior to bid date. Manufacturers catalog data and a completed generator sizing model using the proposed manufacturer's generator sizing software shall accompany each request and authorized acceptance shall be addenda only. Should any substitutions be made, the contractor shall bear responsibility

for the installation, coordination and operation of the system as well as any engineering and redesign costs, which may result from such substitutions.

2.2 PERFORMANCE REQUIREMENTS

A. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.
3. Comply with NFPA 99.
4. Comply with NFPA 110 requirements for Level 1 EPSS.

B. UL Compliance: Engine generator assembly and factory enclosure (if provided) shall be UL 2200 listed.

C. Engine Exhaust Emissions: Comply with applicable US EPA, State and Local Government requirements. Spark-ignited Stationary Emergency: Engines shall be certified by the manufacturer to comply with 40 CFR Part 60 Subpart JJJJ, Table 1, Emission Standards for Stationary Emergency SI Engines and Table 2, Requirements for Performance Tests.

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

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 use.

C. Power Rating: Standby.

D. Service Load: The generator set shall be a Generac model 100 kW, 14.2L with a K0150124Y21 - 100kW (520) alternator. It shall provide 100 kW and 125.0 kVA while operating at the maximum ambient operating temperature and elevation specified in the project documents.

E. Power Factor: 0.8 lagging.

F. Frequency: 60 Hz.

G. Voltage: 208 Volts ac.

H. Phase: Single Phase, three Wire.

I. Induction Method: Naturally aspirated or Turbocharged.

J. Governor: Adjustable isochronous, with speed sensing.

K. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

L. Nameplates: For each major system component to identify manufacturer's name, model and serial number of component.

M. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 10.00 percent variation for 50 percent step-load increase or decrease at unity power factor. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 2.0 Hertz variation for 50 percent step-load increase or decrease at unity power factor. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined in accordance with NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start time to comply with NFPA system requirements.

2.4 ENGINE PERFORMANCE

A. Fuel: Natural gas shall be "pipeline grade" meeting the following conditions:

1. Methane number 80 or greater.
2. High heating value shall be within the range of 950 - 1,150 BTU/scf.
3. Hydrogen sulfide shall not exceed 0.3 g/100 scf.
4. Total sulfur shall not exceed 20 g/100 scf.
5. Water vapor content shall not exceed 0.32 g/100 scf.

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System to be engine mounted.

1. Oil filter shall be engine-mounted replaceable cartridge type with integral bypass valve, in accordance with manufacturer recommendations.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Jacket water heater shall be sized per NFPA110 and UL listed to ensure that genset will start within the specified time period and ambient conditions.

E. Integral Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator set mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gauge glass and petcock.
3. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
4. Maximum Ambient Operating Temperature on Radiator: 104 degrees F (40 degrees C).
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, UV-, and abrasion-resistant fabric.

    a. Rating: 50-psig (345-kPa) maximum working pressure with coolant at 180 deg F (82 deg C), and noncollapsible under vacuum.
    b. Meets SAE 100R1A Type S, EN853 1SN, ISO 1436-1 Type 1SN
    c. a Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer:

1. Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

G. Air-Intake Filter: Heavy duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 12 or 24-V electric, with negative ground.
1. Cranking Cycle: As required by NFPA 110 for system level specified.
2. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle as required by NFPA 110 for system level specified.
3. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 minimum continuous rating.
4. Battery Charger: Current-limiting, automatic-equalizing, and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and NFPA 110 Section 5.6.4.6 for Level 1 systems.:

2.5 FUEL SYSTEM – NATURAL GAS

A. Comply with NFPA 37.

B. Operating Pressure: 7 inches of water column.

C. Flowrate: Maximum gas flow demand at 100% load: 2220 cubic feet per hour.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Manual Starting System Sequence of Operation: Switching on-off switch on the generator control panel to the on position starts engine generator. The off position of same switch initiates engine generator shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

C. Provide minimum run time control set for 15 minutes with override only by operation of a remote emergency-stop switch.

D. Control panel must comply with UL 6200. The controller shall meet ASTM B117 (salt spray test).

E. Connection to Building Management: Provide connections for data transmission of indications to remote data terminals via Modbus.

F. Environmentally Hardened Design: Open circuit boards, edge cards, and PC ribbon cable connections are unacceptable.

G. PCB Construction: Circuit boards with surface-mounted components to provide vibration durability. Circuit boards utilizing large capacitors or heat sinks must utilize encapsulation methods to securely support these components.

H. Configuration:

1. Operating and safety indications, protective devices, basic system controls, and engine gauges shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from engine generator vibration. Panel powered from the engine generator battery.

I. Control and Monitoring Panel:

1. Digital engine generator controller with integrated touch screen, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.

    a. Engine lubricating-oil pressure gauge.
    b. Engine-coolant temperature gauge.
    c. DC voltmeter (alternator battery charging).
    d. Running-time meter.
    e. AC voltmeter, for each phase.

f. AC ammeter, for each phase.
g. AC frequency meter.
h. Generator-voltage adjusting feature.

3. Controls and Protective Devices: Controls, shutdown devices, and common alarm indication, including the following:

a. Cranking control equipment.
b. Run-Off-Auto switch.
c. Control switch not in automatic position alarm.
d. Overcrank alarm.
e. Overcrank shutdown device.
f. Low-water temperature alarm.
g. High engine temperature pre-alarm.
h. High engine temperature.
i. High engine temperature shutdown device.
j. Overspeed alarm.
k. Overspeed shutdown device.
l. Low fuel main tank.

1) Low-fuel-level alarm shall be initiated when the level falls below that required for operation for duration required for the indicated EPSS class.

m. Coolant low-level alarm.
n. Coolant low-level shutdown device.
o. Coolant high-temperature prealarm.
p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. EPS load indicator.
t. Battery high-voltage alarm.
u. Low cranking voltage alarm.
v. Battery-charger malfunction alarm.
w. Battery low-voltage alarm.
x. Lamp test.
y. Contacts for local and remote common alarm.
z. Remote manual stop shutdown device.
aa. Total engine run hours, non-resettable.
bb. Engine generator metering, including voltage, current, hertz, kilowatt, kilovolt ampere, and power factor.

J. Engine Generator Metering: Comply with [Section 260913 "Electrical Power Monitoring and Control."] [Section 262713 "Electricity Metering."] [Section 260913 "Electrical Power Monitoring and Control" and Section 262713 "Electricity Metering."]

K. External Alarm & Status Relays: Provide a separate terminal block, factory wired to Form C dry contacts, for each alarm and status condition required by Building Management or other external systems as shown on electrical drawings.

L. Common Remote Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

M. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Overcrank alarm.
2. Low water-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel main tank alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Contacts for local and remote common alarm.
11. Audible-alarm silencing switch.
12. Air shutdown damper when used.
13. Run-Off-Auto switch.
14. Control switch not in automatic position alarm.
15. Fuel tank derangement alarm.
16. Fuel tank high-level shutdown of fuel supply alarm.
17. Lamp test.
18. Low-cranking voltage alarm.
19. Generator overcurrent-protective-device not-closed alarm.

N. Remote Emergency-Stop Switch: Provide remote emergency stop switch in quantity and style as shown on electrical drawings. Electrical contractor to coordinate exact location with engineer and local AHJ.

O. Engine Run Relay: The generator set shall be provided with a run relay which shall provide a double-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)

P. Data Logging:

1. Event Logging – the controller keeps a record of up to 8,000 events with date and time locally for warning and shutdown faults. This event log can be downloaded onto a USB storage device or onto a PC through the service program.
2. Event Snapshot – the control system shall capture 15 seconds of critical data around the time a fault or warning. This data shall be viewable on the controller and downloadable.
3. Data Logging – the controller shall allow customized parameters to be logged based on a start trigger from the controller interface.

a. The parameters are selectable from all monitored parameters.
b. The sample period shall be configurable from 1 second to 1 day.
c. The collected data shall be stored on a USB storage device plugged into the control panel.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.

2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Overcurrent Protective Device:

1. Unit mounted circuit breakers. Rating, ampacity, accessories, as shown on drawings or as listed below:
2. Molded-case circuit breaker, electronic-trip type; 100 percent rated; complying with UL 489:

a. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
b. Trip Settings: Selected to coordinate with generator thermal damage curve.
c. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
d. Mounting: Adjacent to, or integrated with, control and monitoring panel.

C. Generator Controller Integrated Alternator Protective Functions:

1. Short-time I^2t function: Generator controller-based function shall continuously monitor current level in each phase of alternator output, integrate alternator heating effect over time, and predict when thermal damage of alternator will occur. As overcurrent heating effect on the alternator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator. When signaled by generator protector or other engine generator protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits.
2. Long-time function: Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other engine generator malfunction alarms. Contacts shall be available for load shed functions.
3. Short-circuit fault clearing: Under single- or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.

4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required.

E. Range: Provide range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity. Stator shall be skewed construction to minimize harmonic voltage distortion.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator:

1. Voltage Regulator: Solid-state type, separate from exciter. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain steady-state generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS. The regulator shall provide an adjustable Volts/Hz slope regulation characteristic in order to optimize voltage and frequency response for site conditions.
2. Alternator Excitation: Permanent Magnet Generator (PMG) shall provide excitation power for optimum motor starting and short circuit performance.
3. The generator must accept rated load in one-step.
4. System Transient Voltage Performance: Alternator shall be capable of supplying 271 sKVA with a voltage dip not more than 35% at 0.3 starting power factor. Sustained voltage dip data or manufacturer-published SKVA numbers based on unity PF alternator-only dynamometer testing will not be accepted.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.9 OUTDOOR ENGINE GENERATOR ENCLOSURE

A. Basis of design is a Sound Level 2.

B. Generator packaged within manufacturer's weather protective, sound attenuated enclosure. Enclosure and generator set shall be UL 2200 Listed as a system.

C. Enclosure Construction: Minimum 14 gauge construction. Roof construction shall be raised-seam, gasket-free interlocking panels. Rivets shall not be used on external painted surfaces. Design shall be rodent resistant.

D. Doors shall be equipped with lift-off pin and sleeve type hinges to allow access to the engine, alternator, and control panel. Hinges shall be adjustable for door alignment. Hinges and all exposed fasteners shall be stainless steel. Each door shall be equipped with minimum 2-point latching mechanism and identical keys. Perimeter of all door openings shall include polyethylene gasket.

E. Upward discharging exhaust hood for engine cooling airflow and exhaust.

F. Engine exhaust silencer mounted within enclosure discharge hood.

G. Enclosure Finish: Electrostatic applied powered paint, baked and finished to manufacturer's specifications. Finish system shall be subjected to the following tests:

1. ASTM D1186 - 87; 2.5+ mil Paint Thickness
2. ASTM D3363 - 92a; Material Hardness
3. ASTM D522 - B; Resistance to Cracking
4. ASTM D3359 - B; Adhesion
5. ASTM B117 D 1654; Resistant to Salt Water Corrosion
6. ASTM D1735 D 1654; Resistant to Humidity
7. ASTM 2794 93 (2004); Impact Resistance
8. SAE J1690 - UV Protection"

H. Enclosure Color: Manufacturer's standard color, or custom color matched based on architect's design with color sample provided to generator manufacturer.

I. Wind Rating: Enclosure shall be constructed to attain basic wind speed rating of 110 MPH; WIF 1.15, Exposure Category "C", Building Classification "Enclosed", Topographic Factor Kzt = 1. Wind Design Pressures: windward, 20.6 lb/ft^2; leeward, -12.9 lb/ft^2; roof, -18.0 lb/ft^2."

J. Snow Load Rating: Minimum 70 pounds per square foot.

K. Engine-Cooling Airflow through Enclosure: Maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

L. Sound Insulation: Enclosure and air discharge hood completely lined with reflective silver mylar faced sound attenuating closed cell foam that meets UL 94 HF1 standards for flammability (FMVSS 302 test method). Roof sound insulation panels shall include additional mechanical retention.

M. Sound Performance: The engine generator, while operating at full rated load, shall not exceed 70.00 dBA average measured at 23 ft (7 meters) from the engine generator in a free field environment.

N. Louvers: Fixed-engine, cooling-air inlet and discharge. Stormproof and drainable louvers prevent entry of rain and snow.

O. Convenience Outlet: Factory-wired convenience 120v duplex-outlet within enclosure, GFCI.

2.10 VIBRATION ISOLATION DEVICES

A. Elastomeric Isolator Pads: Oil- and water-resistant elastomer or natural rubber, arranged in single or multiple layers, molded with a nonslip pattern and galvanized-steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to sizes that match requirements of supported equipment for units with a ratings 750kw or below.

1. Material: Standard neoprene separated by steel shims.

B. Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint for units with a rating larger than 750kw.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch- (6-mm-) thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment-mounting and -leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 0.5.

C. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.11 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

B. Project-Specific Equipment Tests: Before shipment, factory test engine generator and other system components and accessories manufactured specifically for this Project. Perform tests at rated load and power factor. Include the following tests:

1. Test components and accessories furnished with installed unit that are not identical to those on tested prototype to demonstrate compatibility and reliability.
2. Test generator, exciter, and voltage regulator as a unit.
3. Full load run.
4. Maximum power.

5. Voltage regulation.
6. Transient and steady-state governing.
7. Single-step load pickup.
8. Safety shutdowns.
9. Report factory test results within 10 days of completion of test.

2.12 FINISHES

A. Indoor and Outdoor Enclosures and Components: Manufacturer's standard finish over corrosion-resistant pretreatment and compatible primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, equipment bases, and conditions, with Installer present, for compliance with requirements for installation and other conditions affecting packaged engine generator performance.

B. Examine roughing-in for piping systems and electrical connections. Verify actual locations of connections before packaged engine generator installation.

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

3.2 PREPARATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service in accordance with requirements indicated:

1. Notify Project Manager in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without written permission.

3.3 INSTALLATION

A. Comply with NECA 1 and NECA 404.

B. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

C. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases or steel dunnage as indicated on drawings.
2. Coordinate size and location of mounting bases for packaged engine generators.
3. Install unit with vibration isolation devices described in section 2.11.

3.4 FIELD QUALITY CONTROL

A. Tests and Inspections: The supplier of the electric generating plant and associated items covered herein shall provide factory certified technicians to inspect the completed installation and to perform an initial startup inspection to include:

1. Ensuring the engine starts (both hot and cold) within the specified time.
2. Verification of engine parameters within specification.
3. Verify no load frequency and voltage, adjusting if required.
4. Test all automatic shutdowns of the engine-generator.
5. Perform a load test of the electric plant, ensuring full load frequency and voltage are within specification by using building load.

B. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.

C. Battery and Charger Tests:

1. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions.
2. Verify that measurements are within manufacturer's specifications."

D. System Integrity Tests: Verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

E. Coordinate tests with tests for transfer switches and run them concurrently.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest and reinspect as specified above.

I. Retest: Correct deficiencies identified by tests and observations, and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations.

3.5 DEMONSTRATION

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

3.6 MAINTENANCE SERVICE

A. Repair Service Capabilities:

1. The generator set supplier shall maintain service parts inventory for the entire power system at a central location which is accessible to the service location 24 hours per day, 365 days per year. The manufacturer of the generator set shall maintain a central parts inventory to support the supplier, covering all the major components of the power system, including: engines, alternators, control systems, paralleling electronics, and power transfer equipment.
2. The generator set shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of power system replacement parts in the local service location. Service vehicles shall be stocked with critical replacement parts. The service organization shall be on call 24 hours per day, 365 days per year. The service organization shall be physically located within 50 miles of the site.
3. The manufacturer shall maintain model and serial number records of each generator set provided for at least 20 years.

B. Preventative Maintenance Service Agreement: The supplier shall include as a line item adder in the proposal, a one-year maintenance service agreement. The maintenance shall be performed by factory authorized service technicians capable of servicing both the engine generator set(s) and the transfer switch(es). This agreement shall include semi-annual preventative maintenance visits to verify operation and/or complete the following:

1. All periodic engine maintenance as recommended by the service manual.
2. All electrical controls maintenance and calibrations as recommended by the manufacturer.
3. All auxiliary equipment as a part of the emergency systems.
4. The supplier shall guarantee emergency service.
5. All expendable maintenance items are to be included in this agreement.
6. A copy of this agreement and a schedule shall be provided in the submittal documents, detailing scope of work and preventative maintenance service visit interval.

END OF SECTION 263213

Section 283100 - Fire Alarm System

I. General

A. The contractor shall install a complete low voltage, addressable, automatic and manual fire alarm system, as specified herein and indicated on the drawings. The system shall include necessary devices required to provide a complete operating system.

B. The system shall comply with the applicable provisions of the National Fire Protection Association Standards and meet all requirements of the local authorities having jurisdiction. All equipment and devices shall be listed by the Underwriters' Laboratories, Incorporated or approved by the Factory Mutual Laboratories.

II. Products

A. The devices shall be as shown on the plans and as required by all applicable codes to satisfy the AHJ. The devices shall be of the latest generation of the installed system.

III. Installation

A. Install devices as indicated on drawings or within this specification.

B. Control Panel shall be Fire-Lite MS9200UDLS, 198-point addressable fire alarm control panel, one SLC loop. Includes 80-character LCD display, single printed circuit board on chasis, <semi-flush><surface> mounted with battery backup or the most updated version of this panel and system.

C. The contractor shall furnish and install, in accordance with manufacturer's instructions, wiring, conduit and outlet boxes required to complete the system as described herein and as shown on the plans. Wiring and devices installed under this section of the specifications shall be installed by a state licensed low voltage contractor. Further, work shall be done by state certified low voltage technicians.

D. Horn strobes shall be tapped at 1 watt each or as required.

E. Speaker strobes shall be tapped at 2 watts each or as required.

F. As built drawings shall be made and turned over to the owner.

G. Wiring shall be installed in ½ RED conduit.

H. Wiring to initiating devices shall be 2#18 AWG CU stranded shielded pair. Wiring to signaling devices shall be 2#14 AWG CU.

I. All wires broken and all screws used on all devices. Loop six inches of wire in each junction box. System shall be tested free from grounds and shorts and left in perfect operation condition.

J. Air handling units shall be controlled by the fire alarm system such that when fire alarm is activated air handling units are shut down. Contractor to provide and install duct mounted smoke detectors in all air handling units that are 2000 cfm whether shown on plans or not. Any duct mounted smoke detectors furnished under other sections of these specifications shall be connected similarly.

K. Connections to external systems, i.e. hood extinguishing systems, air handling units, natural gas control valves, sprinkler riser valves, sprinkler heads, etc.,. are the responsibility of the fire alarm contractor. The fire alarm contractor shall furnish

necessary relays, transformers, contacts, and wiring required to connect external systems to the fire alarm system. No allowance will be made for failure to supply the necessary accessories.

L. Final hook-up, testing and placing system in operation shall be by factory authorized representative capable of furnishing a service contract at the owner's request. Final testing and placing system in service shall be done with the presence of a representative of the City Fire Department, owner, electrical contractor and manufacturer. Complete operating instructions of the system for alarm and trouble shall be given to the owner representative. A statement that this test has been completed shall be signed by all present and a copy given to each.

M. The equipment manufacturer shall be represented by a service organization, and the name of this organization shall be furnished to the Architect and owner. The service organization shall furnish, gratis to the Owner, a one year maintenance and inspection contract, effective from the date of final acceptance.

N. Provide "lock on" device for breaker serving fire alarm system.

O. Prepare a separate drawing showing fire alarm system. Drawing shall be approved and stamped approved by the local authority having jurisdiction. (If no local authority is available, this requirement is not in effect. Make any submissions to state officials that are required.

P. Upon completion of the installation of the fire alarm equipment, the contractor shall provide to the architect and owner a signed written statement substantially in the form as follows: “The undersigned, having been engaged as the contractor on _____ project, confirms that the Fire Alarm Equipment was installed in accordance with the specifications and also in accordance with wiring diagrams, instructions and directions to use by the manufacturer's representative.” The contractor shall also provide all documentation required by the AHJ for final approval.

Q. Provide at final inspection a drawing of floor plan showing the location of each device of the fire alarm system with the addressable location shown at each device. This drawing shall cover all newly installed devices as well as those relocated.

R. Provide a framed drawing adjacent to the fire alarm control panel showing the addressable location of each device.

S. Connect fire alarm panel to outgoing telephone line. Fire alarm panel shall seize line and dial answering service to report alarm condition. This condition should already exist however the contractor shall ensure that it is operational to the satisfaction of the AHJ.

T. The installing contractor shall have all of the certifications and credentials that are required by the state of Georgia for Fire Alarm Installation in all Facilities.

End of Section

SECTION 313116 - TERMITE CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Soil treatment.
2. Wood treatment.
3. Bait-station system.
4. Metal mesh barrier system.

B. Related Requirements:

1. Section 061000 "Rough Carpentry" for wood preservative treatment by pressure process.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components, and profiles for termite control products.
2. Include the EPA-Registered Label for termiticide products.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located and who is accredited by manufacturer.

1.4 FIELD CONDITIONS

A. Soil Treatment:

1. Environmental Limitations: To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring. Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.
2. Related Work: Coordinate soil treatment application with excavating, filling, grading, and concreting operations. Treat soil under footings, grade beams, and ground-supported slabs before construction.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain termite control products from single source from single manufacturer.

2.2 SOIL TREATMENT

A. Termiticide: EPA-Registered termiticide acceptable to authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.

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. Bayer Environmental Science
b. Ensystex, Inc

2. Service Life of Treatment: Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

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

3.2 PREPARATION

A. General: Prepare work areas according to the requirements of authorities having jurisdiction and according to manufacturer's written instructions before beginning application and installation of termite control treatment(s). Remove extraneous sources of wood cellulose and other edible materials, such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and footings. Termiticides may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.

1. Fit filling hose connected to water source at the site with a backflow preventer, according to requirements of authorities having jurisdiction.

3.3 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Distribute treatment uniformly. Apply treatment at the product's EPA-Registered Label volume and rate for maximum specified concentration of termiticide to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction.

1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
2. Foundations: Soil adjacent to and along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing.
3. Penetrations: At expansion joints, control joints, and areas where slabs and below-grade walls will be penetrated.

B. Post warning signs in areas of application.

C. Reapply soil treatment solution to areas disturbed by subsequent excavation, grading, landscaping, or other construction activities following application.

3.4 PROTECTION

A. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

B. Protect termiticide solution dispersed in treated soils and fills from being diluted by exposure to water spillage or weather until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

3.5 MAINTENANCE SERVICE

A. Maintenance Service: Beginning at Substantial Completion, maintenance service shall include 12 months' full maintenance by skilled employees of termite-control-treatment Installer. Include annual maintenance as required for proper performance according to the product's EPA-Registered Label and manufacturer's written instructions. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

B. Continuing Maintenance Proposal: Provide from termite-control-treatment Installer to Owner, in the form of a standard yearly (or other period) 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. Include annual inspection for termite activity and effectiveness of termite treatment according to manufacturer's written instructions.

END OF SECTION 313116