NEXUSPARK

PROJECT MANUAL – VOLUME 1

ISSUED FOR PROPOSAL
MARCH 18, 2022

Perkins&Will

DOCUMENT NO. 00 01 10
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The complete Project Manual for this project consists of this entire bound volume which is not to be separated for any reason. The Architect and Owner will not be responsible for any assumptions made by a Contractor or Subcontractor who does not receive a complete bound Project Manual containing all sections and documents listed in the Table of Contents.

The following listed documents comprise the Project Manual for NexusPark for scope of work defined under Enabling Phase, Phase 1A & Phase 1B. Where numerical sequence of Sections or Divisions is interrupted, such interruptions are intentional.

PROJECT MANUAL

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SECTION 01 10 00

SUMMARY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Project information.
2. Work covered by Contract Documents.
3. Phased construction.
4. Contractor duties.
5. Work by Owner.
6. Work under separate contracts.
7. Future work.
8. Owner-furnished, Contractor-installed products.
9. Access to site.
10. Protection of persons, work, and property.
11. Coordination with occupants.
12. Work restrictions.
13. Specification and Drawing conventions.
14. Provisions for electronic media.

B. Related Requirements:
1. Section 01 50 00 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.2 PROJECT INFORMATION

A. Project Identification: NexusPark
1. Project Location: Columbus, IN.

B. Owner: City of Columbus.
1. Owner's Representative: Mary Ferdon, City of Columbus, (812) 376-2527.

C. Architect Identification: The Contract Documents were prepared for the Project by Perkins&Will, 410 N Michigan Ave. Suite 1600, Chicago, IL 60611; telephone 312-755-0770.

D. Architect’s Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
1. Refer to Title Page.

E. Construction Manager: Taylor Bros. Construction Co., 4555 Middle Road, Columbus, Indiana 47203; telephone (812) 379-9547
   1. 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.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:
   1. Enabling Phase: Site, Utility, and minor renovation work to existing and other Work indicated in the Contract Documents.
   2. Phase 1A: Delegated Design for Pre-engineered Metal Building and Systems
   3. Phase 1B: Interior Renovations of existing Covered Mall and Anchor Buildings.

B. Type of Contract:
   1. Project will be constructed under the following general construction contract:
      a. Cost Plus-Fee (Single Prime Contract) with a guaranteed maximum price.

1.4 CONTRACTOR DUTIES

A. VOC Compliance: Ensure that all assemblies, components, and systems comply with all VOC (Volatile Organic Components) requirements and regulations of the Environmental Protection Agency (EPA), Occupational Safety Health Administration (OSHA), State, County, City, and Local Air Control District.
   1. See Divisions 02 through 28 for Project VOC Restrictions.

B. Except as specifically noted, provide and pay for:
   1. Labor, materials, and equipment.
   2. Tools, construction equipment and machinery.
   3. Water, heat, and utilities required for construction.
   4. Other facilities and services necessary for proper execution and completion of work.

C. Secure and pay for, as necessary for proper execution and completion of Work, and as applicable at time of receipt of bids:
   1. Building Permit.
   2. Licenses.

D. Give required notices.

E. Comply with all applicable local Building Codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on performance of Work.

F. Promptly submit written notice to Architect of observed variance of Contract Documents from requirements of authorities having jurisdiction. Assume responsibility for Work known to be contrary to code or regulatory requirements performed without such notice.

1.5 WORK BY OWNER

A. General: 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. Concurrent Work: Owner will perform the following construction operations at Project site. Those operations will be conducted simultaneously with Work under this Contract.
   1. Furniture, Fittings and Equipment (FF&E).
   2. Telephone System.
   3. Security Access Control System.

1.6 WORK UNDER SEPARATE CONTRACTS

A. General: Cooperate fully with 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 separate contracts.

B. Concurrent Work: Owner will award separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
   1. Enabling & Phase 1A: Delegated Design for Pre-engineered Metal Building and Systems
   2. Phase 1B: Interior Renovations of existing Covered Mall and Anchor Buildings.
   3. Columbus Regional Health interior renovation and additions: Work contracted and conducted outside of this project by separate entity, but within same building and site.

1.7 OWNER-FURNISHED, CONTRACTOR-INSTALLED PRODUCTS

A. Owner will furnish products indicated in Documents. The Work includes receiving, unloading, handling, storing, protecting, and installing Owner-furnished products and making building services connections.

B. Owner-Furnished Products:
   1. Residential Kitchen Appliances
   2. Athletic Field and Gymnasium Equipment

C. Owner Responsibilities: For Owner-furnished, Contractor-installed products, the Owner will:
   1. Arrange for Shop Drawings, Product Data, and Samples and deliver to the Contractor
   2. Arrange and pay for delivery of Owner-furnished items according to Contractor's construction schedule
   3. Inspect delivered items for damage.
   4. Arrange for replacement of Owner-furnished items that are damaged, defective, or missing when delivered to Contractor.
   5. Arrange for manufacturer's field services for delivery of manufacturer's warranties to the Contractor.
   6. Furnish the Contractor the earliest possible delivery date for Owner-furnished products.

D. Contractor Responsibilities: For Owner-furnished, Contractor-installed products, the Contractor shall:
   1. Provide support systems to receive Owner's equipment as well as provide plumbing, HVAC, and electrical connections.
   2. Be present for delivery and assist the Owner's inspection.
   3. Use Owner-furnished delivery dates in Contractor's construction schedule
   4. Review Shop Drawings, Product Data, Samples, and other submittals, and return to the Architect, noting discrepancies or anticipated problems regarding incorporation of the product.
   5. Be responsible for receiving, unloading, handling, and storing Owner-furnished items at Project site.
   6. Protect Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.

7. Repair or replace items damaged because of Contractor's operations with new items matching originally specified items.
8. Install and incorporate Owner-furnished items into the work, in accordance with manufacturer's installation instructions, and make building utility services connections.

1.8 ACCESS TO SITE

A. General: 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 and by Owner's right to perform work or retain other contractors on portions of the project.
   1. During construction, allow for Owner occupancy and public use of, and access to, existing facilities.
   2. Make each entity engaged in work on the Project aware that the existing facilities house operating functions that must remain in operation during the construction period, except as the Owner may otherwise direct. Plumbing, heating, ventilating, electrical, fire alarm, and telephone systems are to be functional throughout the construction period with a minimum of interruptions in service. Do not block any required fire exits.
   3. Confine operations at Project site to areas permitted by law, ordinances, permits, and Contract Documents.
   4. Do not unreasonably encumber site with materials or equipment that hinders access.
   5. Protect and keep safe products stored on premises.
   6. Products and materials are to be stored to not interfere with operations of Owner or other contractors.
   7. Obtain and pay for use of additional storage or work areas needed for operations.

B. Use of Site: Limit use of Project site to areas identified by Logistics Plan provided by Construction Manager. Do not disturb portions of Project site beyond areas in which the Work is indicated.
   1. Limit use of site for work and storage as follows:
      a. Do not use completed paved areas for storage without Owner’s approval.
      b. Restrict Work and storage to areas indicated on Drawings or approved by Owner.
      c. Limit site access to locations approved by Owner.

d. Restrict parking to areas approved by Owner.
e. Do not perform operations that would interrupt or delay Owner's daily operations.

2. Driveways, Walkways and Entrances: Coordinate closure or limited access to existing driveways, loading areas**,** and entrances serving premises with Owner. Otherwise, keep clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
   a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
   b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment onsite.

C. 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.

D. 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.

1.9 PROTECTION OF PERSONS, WORK, AND PROPERTY

A. Contractor shall maintain adequate protection of the Work from damage and shall protect the Owner's and adjacent property from injury or loss arising from the Work.
   1. Repair damage to existing buildings, property, and site caused by employees, subcontractors, or consultants.

B. Contractor shall provide and always maintain OSHA-required danger signs, guards, and obstructions necessary to protect the public and construction personnel from any dangers inherent with or created by the construction of the Work.
   1. Comply with federal, state, and city rules and requirements pertaining to safety, and all EPA standards, OSHA standards, and NESHAP regulations pertaining to asbestos and other hazardous materials.

1.10 COORDINATION WITH OCCUPANTS

A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner

usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.

1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.

1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.11 WORK RESTRICTIONS

A. Work Restrictions, General: Comply with restrictions on construction operations.

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

B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7 a.m. to 7 p.m., Monday through Friday, unless otherwise indicated.

1. Hours for Core Drilling and other noisy activities: Coordinate with Owner. Perform during hours when building is least occupied.
2. Obtain approval from Owner for work outside of these hours.

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:
   1. Notify Construction Manager not less than 72 hours in advance of proposed utility interruptions.
   2. Obtain Construction Manager's written permission before proceeding with utility interruptions.

D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
   1. Notify Construction Manager not less than 72 hours in advance of proposed disruptive operations.
   2. Obtain Construction Manager's written permission before proceeding with disruptive operations.

E. Nonsmoking Property: Smoking is not permitted within the building or on Owner’s property.

1.12 PROVISIONS FOR ELECTRONIC MEDIA

A. Digital Data Files: Electronic drawing/model files of the Contract Drawings will not be furnished by Architect for Contractor's use in preparing submittals unless procedures stated within Section 01 33 00 – “Submittal Procedures” are agreed to and Contractor executes the Agreement Form, and the Contractor properly prepares and submits the Submittals Schedule as indicated in Division 01 Section “Construction Progress Documentation.”

B. For the duration of this Project, it is the intent to distribute information in electronic format where allowable. Drawings, Specifications, Contract Document Modifications, memoranda, letters or other documents issued in the normal course of execution of the Work will be issued and distributed in electronic format (.pdf).
   1. Costs associated with printing and distribution of the project information shall be included in the Contract Sum.
   2. Printed documents will be provided and expected only for documents that are required to be in paper format by this Contract, Authorities Having Jurisdiction, or other statutory requirements.
      a. Drawings that require revision will be reissued for replacement as full-size sheets.
      b. Specifications that require revision will be reissued as complete replacement Specification Sections.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 13 00

DELEGATED DESIGN REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for assemblies and construction systems provided by the Contractor as delegated design.

1.2 DEFINITIONS

A. Delegated: Means delegated by the Owner and Architect to the Contractor.

B. Design: Means the planning, coordination, and graphic and written communication of a portion of the Work, including determination and engineering of system or assembly or system organization and structure, in response to functional requirements, arrangement and performance criteria indicated in the Contract Documents.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Portions of the Contract Documents delegate the design of certain components, assemblies or systems to the Contractor, or may otherwise specify "delegated design requirements" in individual specification Sections.

B. The Contractor is to be responsible for delegated design Work, including design, engineering and performance.

C. Drawings of delegated design portions of Work are diagrammatic and are intended only to show:
   1. Design intent of finished materials, profiles, shapes and forms.
   2. Relationships between elements.

3. Location, identification, dimension and size of components, assemblies and accessories.
4. Schematic attachment details and diagrams of fasteners and connections.

D. Specifications for delegated design portions of the Work establish performance criteria for materials, products, systems, and methods of execution, along with minimum performance requirements for indicated portions of the Work.

E. The Architect will review informational submittals specified herein to determine whether or not the delegated component, assembly or system design complies with the following.
1. That the Contractor's engineering shows substantiation of the specified performance criteria.
2. Conforms to specified performance requirements, including those subsequent modifications.
3. Complies with the overall project design.
4. Can be appropriately integrated into the overall design of the project.
5. Review by the Architect does not relieve the Contractor from compliance with the requirements of the delegated component.

F. In the event of conflicts regarding the Contractor's proposed delegated design solutions and the design intent of the Contract Documents, the decision of the Architect will be final.

1.4 PROCEDURAL REQUIREMENTS

A. Design Requirements: Proposed delegated design solutions are to demonstrate compliance with the original design intent of the Contract Documents, as determined by the Architect.
1. Unless otherwise defined by the Contract Documents, appearance of exposed elements, including member sizes, profiles and alignment of components, are to be within dimensional limits of section profiles indicated on the Drawings, and are to be consistent throughout the Project. Do not deviate from profiles, layouts or arrangements indicated without prior written approval from the Architect.
2. Proposed delegated design solutions that exactly follow details indicated on the Drawings do not relieve Contractor of responsibility for design and performance of delegated design portions of Work.

B. Engineering Requirements: Engineer delegated design portions of the Work to meet or exceed specified performance requirements, to satisfy the requirements of the authorities having jurisdiction, and to provide structurally sound, water and weathertight assemblies capable of withstanding the specified in-service loads without failure.

C. Additional Requirements:
1. Fabricate, assemble and install delegated design portions of the Work to accommodate the full range of manufacturing, operating and field installation tolerances of adjacent work specified in other Sections.
2. If required by the authorities having jurisdiction, submit shop drawings, specifications, calculations and other supporting data necessary for obtaining jurisdiction approval after they have been reviewed by the Architect and prior to beginning installation. Pay fees incurred.

1.5 INFORMATIONAL SUBMITTALS

A. General: Coordinate and process submittals for delegated design portion of Work in same manner as for other portions of Work.

B. Design Data:
   1. Submit engineering calculations demonstrating compliance with the requirements of Contract Documents and of the authorities having jurisdiction.
      a. Provide calculations legible and that incorporate sufficient cross-references to shop drawings to make calculations readily understandable and reviewable.
      b. Test reports are not acceptable as a substitute for calculations.
   2. Structural Calculations: Include the following:
      a. Analysis of framing members.
      b. Section property computations for framing members.
      c. Analysis of anchors, including anchors embedded in concrete
      d. Signature and seal of the qualified Engineer responsible for their preparation.

C. Furnish appropriate certification from licensed fabricator shop or complete detailed inspection reports signed by each inspector performing unlicensed shop inspection to the Architect before the Work affected by these inspections is delivered to the site.

1.6 QUALITY ASSURANCE

A. Engineer Qualifications: Unless stated otherwise in other sections, provide the following:
   1. Professional Engineer legally licensed and qualified to practice in the State of Indiana and experienced in and having a minimum of 10 consecutive years providing the type of engineering services indicated in the Contract Documents.
   2. Engineering services are defined as those performed for the design, fabrication and installation of components and assemblies similar in material, design, complexity and extent to those indicated in the Contract Documents for this Project.

B. Fabricator/Installer Qualifications: Firm with a minimum of 10 consecutive years' experience in the design, testing, fabrication, assembly, installation and coordination of specified components, assemblies and systems on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance. Submit evidence demonstrating the following:
   1. The experience in managing, scheduling, coordinating, and maintaining on-time performance in conjunction with the successful projects and for the proposed project.
   2. An in-place, comprehensive quality assurance and quality control program and procedures that demonstrates how it is being applied on the project. Describe

and demonstrate how the proposed comprehensive quality assurance and quality control program has been successful on other projects.

3. The current resources, including currently employed personnel, to produce the Work to the specified requirements.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Provide products, materials, components and accessories required for a complete installation and operation in the proposed design, whether or not such items are indicated in the Contract Documents.

B. Provide anchors, attachments, hardware, inserts, fasteners, clips, bracing, framework, and similar items as required to meet specified design and performance requirements, and to anchor delegated design Work to adjacent supports, or to related adjoining work, whether or not such items are indicated in the Contract Documents.

PART 3 - EXECUTION

3.1 DESIGN

A. Unless otherwise indicated or specified, maintain design intent and specified performance requirements of the Contract Documents.

1. If certain fabrication or erection methods, minor dimensional changes and detailing adjustments to the original design in the Contract Documents are required, indicate such on submitted Shop Drawings.
2. Prior to shop drawing submittal, obtain written approval from the Architect for proposed changes and adjustments.

B. Engage a qualified Engineer to design connection details and determine fastener types and sizes.

1. Fasteners or connections are not to conflict with or require revision to the design profiles indicated on the Drawings or to the supporting work.
2. Connections are not to impose eccentric loading, nor induce twisting or warping to supporting structure.
3. Design connections to accommodate potential and actual misalignment of adjacent work within tolerances specified in other Sections.

END OF SECTION

SECTION 01 21 00

ALLOWANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements governing allowances.

B. Types of allowances include the following:
   1. Lump-sum allowances.

C. Related Requirements:
   1. Section 01 29 00 “Payment Procedures” for incorporating alternates into the Schedule of Values.
   2. Section 01 60 00 "Product requirements" for product selection procedures.

1.2 DEFINITIONS

A. Allowance: An amount established in the contract documents to include in the total contract price intended to cover the cost of prescribed items that are not specified in enough detail.

B. Allowance Expenditure Authorization (AEA): Form signed by Architect, Owner, and Contractor authorizing Contractor to proceed with a predetermined item of work, for an agreed-upon price.

1.3 ACTION SUBMITTALS

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

1.4 INFORMATIONAL SUBMITTALS

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

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

1.5 COORDINATION

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

1.6 LUMP-SUM 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 not specifically exempted by Project's tax exempt status, 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 under allowance shall be included as part of the Contract Sum and not part of the allowance.

1.7 ADJUSTMENT OF ALLOWANCES

A. Allowance Adjustment: To adjust allowance amounts, prepare a Change Order proposal based on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place where applicable. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
   1. Include installation costs in purchase amount only where indicated as part of the allowance.
   2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.

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

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

3.3 SCHEDULE OF ALLOWANCES

A. Enabling & Phase 1A Project Scope:
1. Allowance No. 1: Lump-Sum Allowance: Include the sum of $200,000 for Owner controlled allowances.

2. Allowance No 2: Lump-Sum Allowance: Include the sum of $400,000 for unforeseen conditions.

3. Allowance No 3: Lump-Sum Allowance: Include the sum of $900,000 for Owner contingency.

3.4 ATTACHMENTS

A. Allowance Expenditure Authorization Form (AEA).

END OF SECTION

Perkins&Will

Allowance Expenditure Authorization Form

To Contractor:		**AEA Number:**	001
		Date of Issuance:	
Project Name:	NexusPark	**P&W Project Number:**	023650.000

Contractor is hereby authorized to perform the following item(s) of work and to adjust the Cash Allowance Sum [**and Contract Time**] accordingly:

Contractor's COR or Proposal Number	Description	Amount
	Total:	

Attachments:

THIS IS NOT A CHANGE ORDER AND DOES NOT CHANGE THE CONTRACT SUM OR CONTRACT TIME

1. The original Cash Allowance was $

Cash Allowance Expenditures prior to this Authorization $

Cash Allowance balance prior to this Authorization $

Cash Allowance will be [**increased**] [**decreased**] by this Authorization $

The new Cash Allowance balance will be $

2. The Contract Time is proposed to [**be adjusted**] [**remain unchanged**]. The proposed adjustment, if any, is [**an increase**] [**a decrease**] of _____ days.

APPROVAL RECOMMENDED:	**OWNER APPROVAL:**	**CONTRACTOR ACCEPTANCE:**
Architect	*Owner*	*Contractor*
Address	*Address*	*Address*
By	*By*	*By*
Date	*Date*	*Date*

SECTION 01 23 00

ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
   1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
   2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
   1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

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

C. Acceptance of Alternates: Alternates will be reviewed and accepted or rejected at Owner's option. Execute accepted alternates under the same conditions as other work of the Contract.
   1. Owner Review Time: Provide 30 days for Owner review and decision of acceptance or rejection of Alternates.

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

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1 – Slab on Grade Thickness
   1. Base Bid: 5" Slab-on-Grade as indicated on Drawings
   2. Alternate: 7" Slab-on-Grade
   3. References:
      a. Drawing Sheets: S1.0-11
      b. Specification: N/A

B. Alternate No. 2 – Portable Wood Athletic Flooring and Subfloor
   1. Base Bid: None
   2. Alternate: Provide 212' x 212' area of Portable Wood Athletic Flooring striped for (6) basketball, (6) volleyball, (9) pickleball (badminton) courts. Provide Turf Protection System for area 10% larger than Portable Wood Athletic Flooring.
   3. References:
      a. Drawing Sheets: N/A
      b. Specifications:
         1) 09 64 23 Portable Wood Athletic Framing
         2) 32 18 13 Synthetic Grass Turf System

C. Alternate No. 3 – Synthetic Grass Turf System
   1. Base Bid: None
   2. Alternate: Provide TURF-1 Synthetic Grass Turf System throughout FIELDHOUSE A-102
   3. References:
      a. Drawing Sheets: A13-01
      b. Specifications: 32 18 13 Synthetic Grass Turf System

D. Alternate No. 4 – Netting & Divider Curtain Systems
   1. Base Bid: Building structure and systems necessary for addition of Netting & Divider Curtain Systems identified in the drawings for this alternate. This includes structural capacity of primary steel systems and electrical capacity and pathway.
   2. Alternate: Provide Netting & Divider Curtain Systems as identified on the drawings along with secondary steel and support systems, electrical installation, as necessary for complete installation and operation.
   3. References:
      a. Drawings Sheets: A11-11, A12-11
      b. Specifications: 11 66 53 Gymnasium Dividers

E. Alternate No. 5 – Remove concrete stem wall
   1. Base Bid: Concrete stem wall, insulation, and masonry furring as identified in elevations and sections.
   2. Alternate: Reduce height of concrete stem-wall/foundation wall to LEVEL 01 and delete masonry furring and insulation above slab. Pre-engineered Metal Building girts, insulation, and exterior meta
   3. References:
      a. Drawings Sheets: N/A

b. Specifications: N/A

F. Alternate No. 6 – Provide Metal Liner Panel
1. Base Bid: None
2. Alternate: Provide Pre-engineered Metal Building manufacturer's standard Metal Liner Panel to a minimum height of 10'-0" above finished floor around the entire FIELDHOUSE A-102.
3. References:
a. Drawing Sheets: N/A
b. Specifications: N/A

END OF SECTION

SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for submitting and processing requests for product substitutions after the award of the construction contract.

B. Related Requirements:
1. Section 01 21 00 "Allowances" for products selected under an allowance.
2. Section 01 23 00 "Alternates" for products selected under an alternate.
3. Section 01 26 00 "Contract Modification Procedures" for determining which modification method and forms are appropriate.
4. Section 01 60 00 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

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

1.3 ACTION SUBMITTALS

A. Substitution Requests: Electronically submit a PDF copy of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
1. Substitution Request Form: Use form provided at the end of this Section.
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
a. Statement indicating why specified product, fabrication, or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for Project, from model code organization acceptable to the authorities having jurisdiction.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

B. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
1. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
2. Acceptance, if granted, will be based on reliance upon data submitted and the opinion, knowledge, information, and belief of the Architect at the time

decision is rendered. Approval therefore is interim in nature and subject to reevaluation and reconsideration as additional data, materials, workmanship, and coordination with other work are observed and reviewed.

3. In proposing items for consideration, Contractor assumes all risk, costs, and responsibility for item's final acceptance, compliance with Contract Documents, integration into the Work, and performance.
4. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.4 QUALITY ASSURANCE

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

B. A Substitution Request for products, assemblies, and equipment constitutes a representation that the Contractor:
   1. Has investigated the proposed product and determined that it meets or exceeds the quality level of the specified product, equipment, assembly, or system.
   2. Has confirmed that the proposed substitution does not affect dimensions or functional clearances.
   3. Agrees to provide the same warranty for the substitution as for the specified product.
   4. Agrees to coordinate installation and make changes to other work that may be required for no additional cost to the Owner.
   5. Waives claims for additional costs or time extension that may subsequently become apparent.

1.5 PROCEDURES

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

1.6 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
   1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
      a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
      b. Substitution request is fully documented and properly submitted.
      c. Requested substitution will not adversely affect Contractor's construction schedule.

d. Requested substitution has received necessary approvals of authorities having jurisdiction.
e. Requested substitution is compatible with other portions of the Work.
f. Requested substitution has been coordinated with other portions of the Work.
g. Requested substitution provides specified warranty.
h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: The Architect will consider requests for substitution received at least 60 days prior to the date the proposed substitution is required to be incorporated into the Work. Requests for substitution received fewer than 60 days prior to the date the proposed substitution is required to be incorporated into the Work may be considered or rejected at the discretion of the Architect.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.
c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is

uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

1.7 ATTACHMENTS

A. Post-Award Substitution Request Form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SUBSTITUTION REQUEST FORM

(For use after Procurement phase)

TO: Perkins&Will
410 N. Michigan Ave, Suite 1600
Chicago, IL 60611

From: _____

_____

_____

Substitution Request No: _____ DATE: _____

Contractor hereby requests acceptance of the following product or system as a substitution in accordance with provisions of Division 01 Section "Substitution Procedures:"

PROJECT SPECIFICATION

Specification Name/Number: _____
Article, Paragraph, Page Number: _____
Item/System to be Substituted: _____

REASON FOR SUBSTITUTION REQUEST

SPECIFIED PRODUCT . . .

- ☐ Is no longer available.
- ☐ Is unable to meet project schedule.
- ☐ Is unsuitable for the designated application.
- ☐ Cannot interface with adjacent materials.
- ☐ Is not compatible with adjacent materials.
- ☐ Cannot provide the specified warranty.
- ☐ Cannot be constructed as indicated.
- ☐ Other: _____
- ☐ Cannot be obtained due to one or more of the following:
  - ☐ Strike
  - ☐ Lockout
  - ☐ Bankruptcy of manufacturer or supplier
  - ☐ Similar occurrence

PROPOSED PRODUCT . . .

- ☐ Will reduce the Contract Time by _____ days.
- ☐ Will reduce the Contract Sum by $ _____.
- ☐ Is an Owner-initiated substitution

Explanation of each item marked above (attach documentation):

_____

_____

_____

EFFECT OF SUBSTITUTION

Proposed substitution affects other work or trades: ☐ No ☐ Yes (if yes, explain)

_____

_____

Proposed substitution requires dimensional revisions or redesign of architectural, structural, mechanical, electrical, plumbing, life safety, or other work:

☐ No ☐ Yes (if yes, attach data explaining revisions)

PRODUCT COMPARISON

Provide side-by-side comparison between proposed substitution and specified product to facilitate review of Substitution Request:

	SPECIFIED PRODUCT:	**PROPOSED PRODUCT:**
Manufacturer:	_____	_____
Name / Brand:	_____	_____
Catalog No.:	_____	_____
Supplier:	_____	_____
Features:	_____	Variations: _____
	_____	_____
	_____	_____
	(Attach additional sheets if necessary)	(Attach additional sheets if necessary)

Local Distributor or Supplier: _____

Manufacturer's Representative: _____

Maintenance Service Available: ☐ Yes ☐ No

Spare Parts Source and Location: _____

Warranty Available is equivalent to the specified warranty: ☐ Yes ☐ No _____ Years

Describe any variation from specified warranty: _____

Product Manufacturing History ☐ New ☐ 2-5 yrs ☐ 6-10 yrs ☐ More than 10 yrs old

SUPPORTING DATA ATTACHED (REQUIRED WHERE APPLICABLE)

☐ Point-by-point comparison of performance criteria, materials, and components of specified product with proposed substitution.

☐ Drawings ☐ Specifications ☐ Product Data ☐ Samples

☐ Tests ☐ Reports ☐ LEED Compliance ☐ Warranty

REFERENCED INSTALLATIONS

Identify at least **three** similar local projects on which proposed substitution was used:

PROJECT #1:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

PROJECT #2:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

PROJECT #3:

Project: _____ Date Installed: _____

Address: _____

_____

Owner: _____

Contact: _____ Telephone: _____

Architect: _____

Contact: _____ Telephone: _____

Contractor: _____

Contact: _____ Telephone: _____

ACKNOWLEDGEMENTS: The undersigned certify that:

- **Performance**: Proposed substitution has been fully investigated and determined to be equal or superior in all respects to the specified product, including appearance, quality, performance, code compliance, and sustainability compliance.
- **Warranty:** Same warranty will be furnished for proposed substitution as for specified product.
- **LEED Compliance (LEED projects only):** Same contribution to LEED program.
- **Operations and Maintenance**: Same maintenance service and source of replacement parts, as applicable, are available locally for the proposed substitution.
- **No Adverse Effect**: Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- **No Adverse Time or Cost**: Cost data and time as stated above are complete. Contractor bears all costs for labor and materials associated with fully integrating proposed substitution into the Project. Claims for additional costs or time related to accepted substitution which may subsequently become apparent are waived.
    - Payment will be made to the Owner for changes to the project design, including Architect's and Engineer's redesign fees and engineering, detailing, special inspection, and construction costs incurred by the Owner caused by acceptance of the substitution.
    - Coordination necessary to fully integrate the proposed substitution, and any associated modifications to related or adjacent Work, have been or will be performed.
- **Dimensions and Clearances**: Proposed substitution does not affect dimensions or functional clearances.
- **Conditions of Acceptance**: The Architect's recommendation for approval, if granted, relies on data submitted and the opinion and knowledge of the Architect at the time decision is rendered. The approval is conditional in nature and subject to reevaluation and reconsideration if additional data or materials are submitted, or coordination with other work is observed to invalidate claims that substitution is equal to item originally specified.

Contractor: _____

(Name of Contractor)

Date: _____ By: _____

Subcontractor: _____

(Name of Subcontractor)

Date: _____ By: _____

Note: *Substitution requests are not part of the standard submittal process and shall not be submitted as part of Shop Drawings, Product Data, or Samples submittals. Substitution requests must be filled out completely. Unresponsive or incomplete requests will be rejected and returned without review.*

ARCHITECT'S REVIEW AND ACTION

☐ Substitution acceptance is recommended.

☐ Substitution acceptance is recommended, with the following comments:_____

_____

☐ Architect's additional services proposal attached.

☐ Resubmit Substitution Request:

- ☐ Provide the following: _____
- ☐ Provide proposal indicating amount of savings / credit to Owner

☐ Substitution acceptance is not recommended:

- ☐ Substitution Request received too late.
- ☐ Substitution Request received directly from subcontractor or supplier.
- ☐ Substitution Request not submitted in accordance with requirements.
- ☐ Substitution Request Form is not properly executed.
- ☐ Substitution Request does not indicate what item is being proposed.
- ☐ Insufficient information submitted to facilitate proper evaluation.
- ☐ Proposed product does not appear to comply with specified requirements.
- ☐ Design Team has no experience with product / manufacturer and is therefore unable to comment on the track record of quality, performance, or reliability.
- ☐ Proposed product will require substantial revisions to Contract Documents.

PERKINS&WILL

Perkins&Will acknowledges its reliance upon information provided by the Contractor, and makes no claim as to the accuracy, completeness, or validity of such information. If an accepted substitution is later found to not comply with requirements of the Contract Documents, the Contractor shall be solely responsible for performance of the work in accordance with requirements of the Contract Documents.

By: _____Date: _____

OWNER'S REVIEW AND ACTION

☐ Substitution is accepted; Architect to prepare Change Order.

☐ Substitution is not accepted.

By accepting this substitution, Owner agrees to compensate Perkins+Will for additional services, if any, necessary to implement the substitution.

Additional Services: $_____

By: _____Date: _____

(Owner's Representative)

END OF FORM

SECTION 01 26 00

CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
1. Section 01 21 00 "Allowances" for procedural requirements for handling and processing allowances.
2. Section 01 22 00 "Unit Prices" for administrative requirements for using unit prices.
3. Section 01 25 00 "Substitution Procedures" for administrative procedures for handling requests for substitutions made after the Contract award.
4. Section 01 31 00 "Project Management and Coordination for Requests for Interpretation" for administrative procedures for handling RFIs.

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, "Architect's Supplemental Instructions," or substantially similar form generated by the Architect.

1.3 PROPOSAL REQUESTS

A. Owner-Initiated Proposal Requests: Construction Manager 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. Proposal Requests issued by Construction Manager are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
2. Contractor's Action: Within 7 days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
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 separate costs of labor, materials, equipment 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.
e. Quotation Form: Use forms acceptable to Construction Manager.

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 Construction Manager.
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 separate costs of labor, materials, equipment 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 01 25 00 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Proposal Request Form: Use form acceptable to Construction Manager.

1.4 ADMINISTRATIVE CHANGE ORDERS

A. Allowance Adjustment: See Section 01 21 00 "Allowances" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect actual costs of allowances.

1.5 CHANGE ORDER PROCEDURES

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

1.6 CONSTRUCTION CHANGE DIRECTIVE

A. Construction Change Directive: Construction Manager may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs

Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 29 00

PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
1. Section 01 21 00 "Allowances" for procedural requirements governing the handling and processing of allowances.
2. Section 01 26 00 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
3. Section 01 32 00 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 DEFINITIONS

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

1.3 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's Construction Schedule.
1. 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.
3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of 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. Name of Architect.
      c. Architect's project number.
      d. Contractor's name and address.
      e. Date of submittal.
   2. Submit draft schedule of values using AIA Document G703.
   3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:
      a. Related Specification Section.
      b. Description of the Work.
      c. Name of subcontractor.
      d. Name of manufacturer or fabricator.
      e. Name of supplier.
      f. Change Orders (numbers) that affect value.
      g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
         1) Labor.
         2) Materials.
         3) Equipment.
   4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
      a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance that covers items stored at a bonded warehouse, and during transport to the project site.
   5. Provide separate line items in the Schedule of Values for each part of the Work where Applications for Payment may include cost of submittals.
      a. Cost for submittals shall represent true cost of submittals preparation, as evidenced by subcontractor invoices, but not to exceed 5 percent of the total value of that item of work line item.
   6. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
   7. Overhead Costs: Show cost of temporary facilities and other major cost items that are not direct cost of actual work-in-place as separate line items.
   8. Closeout Costs. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.

9. 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.

1.4 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 Construction Manager and paid for by Owner.

B. Payment Application Times: On or before the 20th day of the month, Contractor may submit to Architect itemized Application for Payment for work completed during previous calendar month.
   1. Submit draft copy of Application for Payment seven days prior to due date for review by Architect.

C. Application for Payment Forms: Use AIA Document G732 and AIA Document G703] as form for Applications for Payment.
   1. Other Application for Payment forms proposed by the Contractor shall be acceptable to Construction Manager 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 PDF of Application for Payment to Architect within 24 hours. Include waivers of lien and similar attachments if required.
   1. Provide 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.
   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. Preparation and Submittal of Draft of Initial Application for Payment (Pencil Copy):
   1. Prepare draft copy of Application for Payment and meet with Owner and Architect to review the draft copy prior to submittal of the Application for Payment.
   2. Provide four (4) draft (pencil) copies within two (2) business days before the day of the review meeting with Owner and Architect. Submit substantiating data with each application copy: subcontractor applications for payment, copies of invoices, storage receipts, and data required by Owner
   3. After review of draft (pencil) copy by Owner, Architect, and Contractor, prepare Application for Payment, using agreed-upon data on Owner/Architect-reviewed schedule of values and Owner/Architect-reviewed pencil draft.
   4. Include specified information required for application preparation.

I. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
   1. Copy of executed Agreement between Owner and Contractor.
   2. List of subcontractors.
   3. Schedule of values.
   4. Contractor's construction schedule (preliminary if not final).
   5. Products list (preliminary if not final).
   6. Schedule of unit prices.
   7. Submittal schedule (preliminary if not final).
   8. List of Contractor's staff assignments.
   9. List of Contractor's principal consultants.
   10. Copies of building permits.
   11. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
   12. Initial progress report.
   13. Report of preconstruction conference.

14. Certificates of insurance and insurance policies.
15. Performance and payment bonds.

J. Payment Applications During Construction: Submit changes in submittals schedule, construction schedule, and other schedules with each application for payment.

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

L. 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. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. Evidence that claims have been settled.
5. 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.
6. Include documentation that the facility has been inspected by a registered or licensed representative of the state's Department of Licensing and Regulations and that any items noted as non-compliant have been corrected and approved.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
   1. General coordination procedures.
   2. Coordination drawings.
   3. Requests for Information (RFIs).
   4. Digital project management procedures.
   5. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
   1. Section 01 31 06 "Coordination Drawings" for coordination drawing requirements.
   2. Section 01 32 00 "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
   3. Section 01 73 00 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
   4. Section 01 77 00 "Closeout Procedures" for coordinating closeout of the Contract.
   5. Section 01 91 13 "General Commissioning Requirements" for coordinating the Work with Owner's Commissioning Authority.

1.2 DEFINITIONS

A. BIM: Building Information Modeling.

B. RFI: Request from Owner, Construction Manager, Architect, or Contractor seeking information required for clarifications of the Contract Documents.

C. PIMS: Web-based Project Information Management System managed by the Contractor and for use by Owner, Owner's Consultants, Architect and Architect's Consultants.

1.3 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
   1. Name, address, telephone number, and email address of entity performing subcontract or supplying products.
   2. Number and title of related Specification Section(s) covered by subcontract.
   3. Drawing number and detail references, as appropriate, covered by subcontract.
   4. Post list on PIMS and always keep current.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Post copies of list in project meeting room, in temporary field office, on PIMS and in prominent location in built facility. Always keep list current.

C. Administrative and Personnel: In addition to Project superintendent, identify other administrative and supervisory personnel as required for proper performance of the Work. Identify individuals and their duties and responsibilities; list their addresses and telephone numbers, including home, office, and cellular telephone numbers and email addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
   1. Include personnel required for coordination of operations with other contractors.

D. Coordination Drawings:
   1. Contractor's stamped, dated and approved Coordination Drawings.
      a. Retain on site, transmittals and one copy of Contractor's Coordination Drawings.

1.4 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.
4. Where availability of space is limited, coordinate installation of components to ensure maximum performance and accessibility for required maintenance, service, and repair of components, including mechanical and electrical.

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.

C. Conservation: Coordinate construction activities to ensure operations are carried out with consideration given to conservation of energy, water, and materials.
1. Salvage materials and equipment involved in performance of, but not actually incorporated into the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 COORDINATION DRAWINGS

A. Coordination Meetings: Conduct coordination meetings with subcontractors. Owner and Architect may or may not be present at such meetings.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and time a minimum of three days prior to the meeting date.

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

C. Review: Architect will review coordination drawings to confirm that 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.

D. Coordination Digital Data Files: Prepare coordination digital data files according to the following requirements:
1. File Preparation and Submittal Format: Same digital data software program, version, and operating system as original Drawings.
2. Architect will furnish Contractor one set of digital data files of Drawings for use in preparing coordination digital data files.
a. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Drawings.

b. Contractor shall execute a data licensing agreement in the form of Electronic File Transfer Agreement included in this Project Manual or a Digital Execution Plan agreed to by the Owner, Contractor and Architect.

1.6 REQUEST FOR INFORMATION (RFI)

A. General: Immediately on discovery of the need for additional information, clarifications or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
1. Contractor shall submit RFIs to Architect using PIMS.
2. Architect shall provide Contractor with a list of design team contacts by discipline for RFI distribution.
3. Concurrent with submission to the Architect, Contractor shall also distribute RFIs to appropriate design team professionals, using PIMS, based on the disciplines affected by the RFI.
4. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
5. Coordinate and submit RFIs in a prompt manner to avoid delays in Contractor's work or work of subcontractors.
6. Include only one subject or item per RFI. RFIs that include more than one subject or item will be returned without review to the Contractor.

B. Contractor’s failure to report discrepancies or omissions in the Contract Documents, or Contractor- or Subcontractor-generated assumptions, in lieu of Architect-issued clarifications regarding the intent of the Contract Documents, shall not be used as a basis for future claims once the apparent discrepancies or omissions have been reconciled by appropriate interpretation issued by the Architect.

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

D. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.
   1. Attachments shall be electronic files in PDF format.

E. RFI Submission Procedure:
   1. Post electronic submittals as PDF electronic files directly to the Contractor's PIMS as described below.

F. Architect's Action: Architect will review each RFI, determine action required, and respond as indicated in the project General Conditions. Allow seven working days for Architect's response for each RFI.
   1. RFIs received by Architect after 1:00 p.m. in Architect's time zone will be considered as received the following working day.
   2. Where the due date for an action or response occurs on a Saturday, Sunday, or legal holiday, such action or response shall be considered due on the next day that is not a Saturday, Sunday, or legal holiday.
   3. The following RFIs will be returned without action:
      a. RFIs addressing more than one subject or item.
      b. Requests for approval of submittals.
      c. Requests for approval of substitutions.
      d. Requests for approval of Contractor's means and methods.
      e. Requests for approval of nonconforming Work.
      f. Requests for coordination information already indicated in the Contract Documents.
      g. Requests for adjustments in the Contract Time or the Contract Sum.
      h. Requests for interpretation of Architect's actions on submittals.
      i. Incomplete RFIs or inaccurately prepared RFIs.
   4. Architect's action may include a request for additional information, in which case Architect's time for response will begin at the time of receipt by Architect of additional information.
   5. RFIs involving requests for recommendations or design assistance on how to address remediation or correction of nonconforming work are not eligible for an increase in Contract Sum or an extension of Contract Time, regardless of when the RFIs are returned, or the corrective action proposed therein.
   6. 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 01 26 00 "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.
         1) If Contractor's notification is submitted more than 21 days after receipt of the RFI response, any work resulting from the RFI response is not eligible for an increase in Contract Sum or an extension of Contract Time.
   7. In the event Contractor requests an accelerated RFI review and response by Architect, Architect will endeavor to accommodate Contractor's request.

However, any such desired accelerated review times shall not supersede the requirements of the Contract, and no extension of Contract Time will be authorized because of Architect's failure or inability to adhere to Contractor's desired accelerated review times.

8. Architect will return a response to the RFI via the PIMS.

G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Software log with not less than the following:
1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date the RFI response is due.
8. List of parties the RFI was distributed to.
9. Date Architect's response was received.
10. Date the RFI was closed by the Contractor.
11. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

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

1.7 DIGITAL PROJECT INFORMATION MANAGEMENT

A. Use of Architect's Digital Data Files: Digital data files of Architect's BIM model will be provided by Architect for Contractor's use during construction.
1. Digital data files may be used by Contractor in preparing coordination drawings, Shop Drawings, and Project record Drawings.
2. Architect makes no representations as to the accuracy or completeness of digital data files as they relate to Contract Drawings.
3. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.

B. Web-Based Project Information System (PIMS): Construction Manager will provide, administer, and use web-based Project software for purposes of hosting and managing Project communication and documentation until Final Completion.
1. PIMS shall be similar to Procore, Ebuilder, Autodesk Construction Cloud or Plangrid but shall include, at a minimum, the following features:
a. Project Directory, including Contractor, subcontractors, Architect, Architect's consultants, Owner, and other entities involved in Project. Include names of individuals and contact information.
b. Access control for each entity for each workflow process, to determine entity's digital rights to create, modify, view, and print documents.

c. Document workflow planning, allowing customization of workflow between project entities.
d. Creation, logging, tracking, and notification for Project communications required in other Specification Sections, including, but not limited to, RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders.
e. Track status of each Project communication in real time, and log time and date when responses are provided.
f. Procedures for handling PDFs or similar file formats, allowing markups by each entity. Provide security features to lock markups against changes once submitted.
g. Processing and tracking of payment applications.
h. Processing and tracking of contract modifications.
i. Creating and distributing meeting minutes.
j. Document management for Drawings, Specifications, and coordination drawings, including revision control.
k. Management of construction progress photographs.
l. Mobile device compatibility, including smartphones and tablets.
m. Creating and exporting editable logs for all PIMS functions including, but not limited to: RFIs, submittals, Minor Changes in the Work, Construction Change Directives, and Change Orders. Owner, Architect and Architect's Consultants shall have rights and ability to download logs at any time.

2. At completion of Project, change of PIMS or end of Owner-Contractor Contract, provide digital archive in format that is readable by common desktop software applications in format acceptable to Architect. Provide data in locked format to prevent further changes.

C. PDF Document Preparation:
1. Assemble each RFI package into a single indexed file incorporating all information required in this section.
2. Assemble each submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form.
3. Name file with a unique identifier, including revision identifier.
4. Certifications: Where digitally submitted certificates and certifications are required, provide a digital signature with digital certificate on where indicated.

1.8 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and

Architect of scheduled meeting dates and time a minimum of **5** days prior to the meeting date.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees using PIMS.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes using PIMS to everyone concerned, including Owner and Architect, within three daysof the meeting.
4. Conduct the conference to review responsibilities and personnel assignments.
5. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, 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.
6. Agenda: Discuss items of significance that could affect progress, including but not limited to the following:
    a. Tentative construction schedule.
    b. Phasing.
    c. Critical work sequencing and long-lead items.
    d. Designation of key personnel and their duties.
    e. Lines of communications.
    f. Procedures for processing field decisions and Change Orders.
    g. Procedures for RFIs.
    h. Procedures for testing and inspecting.
    i. Procedures for processing Applications for Payment.
    j. Distribution of the Contract Documents.
    k. Submittal procedures.
    l. Preparation of record documents.
    m. Use of the premises and existing building.
    n. Work restrictions.
    o. Working hours.
    p. Owner's occupancy requirements.
    q. Responsibility for temporary facilities and controls.
    r. Procedures for moisture and mold control.
    s. Procedures for disruptions and shutdowns.
    t. Construction waste management and recycling.
    u. Parking availability.
    v. Office, work, and storage areas.
    w. Equipment deliveries and priorities.
    x. First aid.
    y. Security.
    z. Progress cleaning.
    aa. Special procedural, inspection and submittal requirements of the Authorities Having Jurisdiction.
7. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes using PIMS.

B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity as indicated in individual Sections.
    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 Construction Manager of scheduled meeting dates.

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

C. Project Closeout Conference: **Schedule and conduct** a project closeout conference, at a time convenient to Owner, Construction Manager, 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, Construction Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect or delay Project closeout, including but not limited to the following:
    a. Preparation of record documents.
    b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
    c. Submittal of written warranties.
    d. Requirements for preparing operations and maintenance data.
    e. Requirements for delivery of material samples, attic stock, and spare parts.
    f. Requirements for demonstration and training.
    g. Preparation of Contractor's punch list.
    h. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
    i. Submittal procedures.
    j. Coordination of separate contracts.
    k. Owner's partial occupancy requirements.
    l. Installation of Owner's furniture, fixtures, and equipment.
    m. Responsibility for removing temporary facilities and controls.
    n. Close of PIMS and export of data to Owner and Architect.
4. Minutes: Entity conducting meeting will record and distribute meeting minutes using PIMS.

D. Progress Meetings: Conduct progress meetings at biweekly intervals.
1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: In addition to representatives of Owner, 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) Deliveries.
      5) Off-site fabrication.
      6) Access.
      7) Site utilization.
      8) Temporary facilities and controls.
      9) Progress cleaning.
      10) Quality and work standards.
      11) Status of correction of deficient items.
      12) Field observations.
      13) Status of RFIs.
      14) Status of proposal requests.
      15) Pending changes.
      16) Status of Change Orders.
      17) Pending claims and disputes.
      18) Documentation of information for payment requests.
4. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information using PIMS.
   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

SECTION 01 32 00

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.
   4. Material location reports.
   5. Site condition reports.
   6. Special reports.

B. Related Requirements:
   1. Section 01 29 00 “Payment Procedures” for submitting the Schedule of Values.
   2. Section 01 31 00 “Project Management and Coordination” for submitting and distributing meeting and conference minutes.
   3. Section 01 33 00 "Submittal Procedures" for submitting schedules and reports.
   4. Section 01 40 00 "Quality Requirements" for submitting a schedule of tests and inspections.

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 when activities can be performed and the critical path of Project.

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 is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Major Area: A story of construction, a separate building, a separate wing, a major department, or a similar significant construction element.

G. Milestone: A key or critical point in time for reference or measurement.

H. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.3 INFORMATIONAL SUBMITTALS

A. Submittals Format: Reference Section 01 33 00 "Submittal Procedures" for requirements.

B. Submittal Schedule: Arrange the following information in a tabular format:
   1. Specification Section number and title.
   2. Submittal category (action or informational).
   3. Name of subcontractor.
   4. Description of the Work covered.
   5. Scheduled date for first submittal.
   6. Date of submission.
   7. Scheduled date for Architect and Owner's final release or approval.
   8. Fabrication and delivery time frame.
   9. Required on job date.
   10. Approval date.

C. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
   1. Submit a working electronic copy of schedule. Include type of schedule (initial or updated) and date on label.

D. CPM Reports: Concurrent with CPM schedule, submit each of the following reports. Format for each activity in reports shall contain activity number, activity description, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of activities sorted by activity number and then early start date, or actual start date if known.
   2. Logic Report: List of preceding and succeeding activities for activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

3. Total Float Report: List of activities sorted in ascending order of total float.

E. Construction Schedule Updating Reports: Submit with Applications for Payment.

F. Daily Construction Reports: Submit at weekly intervals.

G. Material Location Reports: Submit as required with monthly payment application.

H. Site Condition Reports: Submit immediately at time of discovery of differing conditions.

I. Special Reports: Submit at time of unusual event.

1.4 QUALITY ASSURANCE

A. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Section 01 31 00 "Project Management and Coordination." Review methods and procedures related to Contractor's construction schedule, including, but not limited to, the following:
1. Review format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including phasing, area separations, milestones, and partial Owner occupancy.
4. Review delivery dates for Owner-furnished products.
5. Review schedule for work of Owner's separate contracts.
6. Review submittal requirements and procedures.
7. Review time required for review of submittals and resubmittals.
8. Review requirements for tests and inspections by independent testing and inspecting agencies.
9. Review time required for Project closeout and Owner startup procedures, including commissioning activities.
10. Review and finalize list of construction activities to be included in schedule.
11. Review procedures for updating schedule.

1.5 COORDINATION

A. Coordinate Contractor's construction schedule with the submittal schedule, progress reports, 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.

PART 2 - PRODUCTS

2.1 SUBMITTAL SCHEDULE

A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for initial review, at

least one resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

1. Initial Submittal: Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
2. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

B. Restrictions and Limitations:

1. Submittal review and processing times listed in Division 01 Section "Submittal Procedures" shall be considered baselines and shall take precedence over any lesser times promulgated by Contractor in the Submittal Schedule or Construction Schedule.
2. No delay claim will be entertained, and no extension of the Contract Time will be authorized due to Contractor's failure to transmit submittals enough in advance of the Work to permit proper and reasonable processing.
3. If the Contractor fails to submit a Submittal Schedule or fails to provide submittals in accordance with the approved Submittal Schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

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

1. Contract completion date shall not be changed by submission of a schedule that shows an earlier or later completion date, unless specifically authorized by Change Order.

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

1. Use "one workday" as the unit of time for individual activities. Indicate nonworking days and holidays incorporated into the schedule in order to coordinate with the Contract Time.
2. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect and Owner.
3. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
4. Submittal Review Time: Include review and resubmittal times indicated in Section 01 33 00 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
5. Startup and Testing Time: Include time as required by Owner for startup and testing. Startup and Testing must be completed by Substantial Completion.
6. Commissioning: Include time as required by Owner for commissioning, startup, and testing. Commissioning must be completed by Substantial Completion.

7. Substantial Completion: Indicate date established for Substantial Completion. Allow time for Architect and Owner's administrative procedures necessary for certification of Substantial Completion.
8. Punch List and Final Completion: Include time as required by Owner for completion of punch list items and final completion.
9. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
1. Work under More Than One Contract: Include a separate activity for each contract.
2. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Section 01 10 00 "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
3. Work Restrictions: Show the effect of the following items on the schedule:
   a. Coordination with existing construction.
   b. Limitations of continued occupancies.
   c. Uninterruptible services.
   d. Partial occupancy before Substantial Completion.
   e. Use of premises restrictions.
   f. Provisions for future construction.
   g. Seasonal variations.
   h. Environmental control.
4. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities.

D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion**.**

E. Upcoming Work Summary/Look-Ahead Schedule: 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 Contract Time.

F. Recovery Schedule: When periodic update indicates the Work is **14** or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule. Indicate changes to working hours, working days, crew sizes, and

equipment required to achieve compliance, and date by which recovery will be accomplished.

G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using the Critical Path Method.

B. Startup Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 90 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's construction schedule using a time-scaled CPM network analysis diagram for the Work.
   1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
      a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect and Owner's approval of the schedule.
   2. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

D. CPM Schedule Preparation: Prepare a list of activities required to complete the Work. Using the startup network diagram, prepare a skeleton network to identify probable critical paths.
   1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
      a. Preparation and processing of submittals.
      b. Mobilization and demobilization.
      c. Purchase of materials.
      d. Delivery.
      e. Fabrication.
      f. Utility interruptions.
      g. Installation.
      h. Work by Owner that may affect or be affected by Contractor's activities.
      i. Testing and commissioning.
      j. Punch list and final completion.
      k. Activities occurring following final completion.
   2. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as

often as necessary to produce the CPM schedule within the limitations of the Contract Time.

3. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.

E. Contract Modifications: For each proposed contract modification, if applicable and concurrent with its submission, prepare a time-impact analysis to demonstrate the effect of the proposed change on the overall project schedule.

F. Initial Issue of Schedule: Prepare diagram from a sorted activity list indicating straight "early start-total float." Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Main events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.

G. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
4. Changes in activity durations in workdays.
5. Changes in the critical path.
6. Changes in total float or slack time.
7. Changes in the Contract Time.
8. Changes in scheduled early completion of areas in accordance with Phasing requirements. Refer to Section 01 10 00 "Summary of Work."

2.4 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. Accidents.
8. Meetings and significant decisions.
9. Unusual events (see special reports).
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Construction Change Directives received and implemented.

16. Services connected and disconnected.
17. Equipment or system tests and startups.
18. Partial completions and occupancies.
19. Substantial Completions authorized.
20. Construction photographs with descriptions.

B. Material Location Reports: At monthly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site. 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 in accordance with RFI provisions of Section 01 31 00 "Project Management and Coordination.” Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report immediately. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with application for payment.
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.

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

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:
1. Section 01 29 00 "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Section 01 31 00 "Project Management and Coordination"; for submitting RFIs, issuing meeting minutes, and submitting Coordination Drawings requirements.
3. Section 01 32 00 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's Construction Schedule.
4. Section 01 40 00 "Quality Requirements" for submitting test and inspection reports.
5. Section 01 77 00 "Closeout Procedures" for submitting warranties.
6. Section 01 78 23 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
8. Section 01 79 00 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

A. Submittals: Written and graphic information and physical samples.

B. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users can access files.

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.3 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. 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 submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 business 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 10 business days for review of each resubmittal.

C. Electronic Submittals: Identify and incorporate information in each electronic submittal file 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.
    a. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 06 10 00.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06 10 00.01.A).
3. Use submittal schedule to permanently record Contractor's review and approval markings and action taken by Architect and Owner.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner.

D. Options: Identify options requiring selection by the Architect and Owner.

E. Deviations: Identify deviations from the Contract Documents on submittals.
1. Clearly identify deviations from the Contract Documents by clouding or other suitable means acceptable to Architect and Owner.
    a. Provide accompanying detailed written explanation for each deviation.
    b. Provide the corresponding specification Section labeled with compliance and non-compliance.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

G. 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.

H. Use for Construction: Use only final submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
   1. Post electronic submittals as PDF electronic files directly to FTP site specifically established for Project as agreed to by Architect and Owner.
      a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
   2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
      a. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
   3. Test and Inspection Reports Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
   1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
   2. Mark each copy of each submittal to show which products and options are applicable.
   3. Include the following information, as applicable:
      a. Manufacturer's catalog cuts.
      b. Manufacturer's product specifications.
      c. Standard color charts.
      d. Statement of compliance with specified referenced standards.
      e. Testing by recognized testing agency.
      f. Application of testing agency labels and seals.
      g. Notation of coordination requirements.
      h. Availability and delivery time information.
   4. For equipment, include the following in addition to the above, as applicable:
      a. Equipment dimensional drawings.
      b. Wiring diagrams showing factory-installed wiring.
      c. Printed performance curves.
      d. Operational range diagrams.
      e. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
   5. Submit Product Data concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based upon Architect's digital data drawing files is otherwise permitted.
   1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
      a. Identification of products.
      b. Schedules.
      c. Compliance with specified standards.
      d. Notation of coordination requirements.
      e. Notation of dimensions established by field measurement.
      f. Relationship and attachment to adjoining construction clearly indicated.
      g. Seal and signature of professional engineer if specified.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
   1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
   2. Identification: Attach label on unexposed side of Samples that includes the following:
      a. Generic description of Sample.
      b. Product name and name of manufacturer.
      c. Sample source.
   3. Number and title of applicable Specification Section.
   4. Number of Samples: Submit samples as required in individual Specification Sections.
   5. Disposition: When possible, 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 responsibility of Contractor.

E. Coordination Drawing Submittals: Comply with requirements specified in Section 01 31 00 "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Section 01 32 00 "Construction Progress Documentation."

G. Application for Payment: Comply with requirements specified in Section 01 29 00 "Payment Procedures."

H. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

I. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on American Welding Society (AWS) forms. Include names of firms and personnel certified.

J. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

K. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

L. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

M. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

N. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

O. Product Test Reports: Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

P. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

Q. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

R. Field Test Reports: Submit reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

S. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

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

2.2 DELEGATED-DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file 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.

C. BIM File Incorporation: Incorporate delegated-design drawing and data files into Building Information Model established for Project.

D. Provide delegated-design drawings to Owner in electronic format.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action 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. Project Closeout and Maintenance/Material Submittals: Refer to requirements in Section 01 77 00 "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are not acceptable, will be considered non-responsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

3.3 ATTACHMENTS

A. Appendix A – Electronic Drawing File Transfer Agreement Form.

B. Appendix B – Submittal Transmittal Form.

END OF SECTION

Perkins&Will

Electronic File Transfer Agreement (Contractor – BIM Files)

Name		**Date:**	[Publish Date]
Address		**Project Name:**	**NexusPark**
Description of Data:	Architectural BIM File	**Project No:**	**023650.000**

The undersigned is a contractor (the "Contractor") performing services and/or directly or indirectly providing goods and material related to the subject project (the "Project"). The undersigned hereby requests that Perkins&Will and its consultants provide electronic files prepared by Perkins&Will and its consultants for the Project in the form of an electronic model (the "Model Files"). The undersigned acknowledges and agrees that Perkins&Will has no contractual obligation, or any other obligation, to provide the Model Files to the contractor. Perkins&Will agrees to provide the Model Files in consideration for the undertakings of the undersigned. The undersigned agrees that the Contract Documents that Perkins&Will is contractually obligated to prepare and/or deliver are hardcopy drawings and specifications only. The undersigned additionally agrees that the Model Files are not Contract Documents (as that term is defined in or understood to mean in the Owner-Contractor Agreement), do not represent Contract Document modifications, and are not intended to be a substitute for or a supplement to the hardcopy drawings and specifications, or to necessarily represent actual physical conditions on the Project site.

Model Files to be furnished include work prepared by Perkins&Will and its consultant(s) only. The Model Files were prepared by Perkins&Will using the Autodesk® Revit® software platform. Model Files will be furnished in that software platform's standard format without modifications for the Contractor's convenience. One set of electronic Model Files will be furnished to the Contractor. The Contractor assumes responsibility for distributing pertinent files to the subcontractors.

The undersigned agrees that the request to provide the Model Files is purely for the convenience of the undersigned and does not constitute the rendering of professional services. Perkins&Will has prepared the Model Files to facilitate the production of the Contract Documents, which are reasonably accurate and complete to the extent of the standard of professional care. The undersigned acknowledges that Perkins&Will does not represent the furnished Model Files as being accurate or complete, as being suitable for the Contractor's purpose, or as identifying or containing any issue, anomaly, omission, or concern with reference to the Project.

The undersigned agrees and understands that the Model Files, except as expressly set forth above, are not fit for any particular purpose, including but not limited to quantity take-offs; pricing; clash detection; ascertainment of construction or installation tolerances and clearances; preparation of shop drawings, coordination drawings, or fabrication drawings; construction sequencing; or the manufacture of any building component or system. As such, the Model Files, and the information contained in them, and the information that may have been omitted from them, shall not be used as a basis for an increase in the Contract Sum or Contract Time.

The undersigned acknowledges that the Model Files have not necessarily been developed with the assistance or specific expertise of the individual subcontractors and installers, and therefore do not

account for or incorporate means and methods required by individual subcontractors for their scope of the finished Work. Modifications to the information about the components included in the Model Files may be required and are the responsibility of the Contractor to ascertain, coordinate, and implement. All such modifications are part of the scope of Work of this Project and shall be provided at no additional cost to Owner.

The undersigned further acknowledges that Perkins&Will has made no representations to the undersigned that the Model Files are suitable for any purpose other than as expressly set forth above, or will be usable by the undersigned's systems, infrastructure, or software. The undersigned also understands and agrees that the Model Files may be subject to anomalies, errors, viruses, malware, or other unintended defects, and that Perkins&Will has not reviewed or determined whether such defects may be present in any electronic files. Use of these electronic files is solely at the risk of the undersigned.

The undersigned agrees to release any and all claims that they may have at any time against Perkins&Will or its consultants arising out of the use of the Model Files by the undersigned or by any other individual or entity. The undersigned agrees to hold harmless and indemnify Perkins&Will and its consultants from and against all claims, liabilities, losses, damages, and costs, including but not limited to attorney's fees arising from or in any way connected with the provision of the Model Files by Perkins&Will or the use, modification, misinterpretation, misuse, or reuse by others of the Model Files provided by Perkins&Will. The undersigned shall not use, modify, or reproduce any of the Model Files without first removing identifying information for Perkins&Will and its consultants that may be incorporated in the furnished Model Files.

The undersigned confirms that it will use the Model Files only with reference to the Project and shall not copy or distribute the Model Files, or permit the Model Files to be copied or distributed by others, except for use on this Project. The undersigned shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms and conditions of this Agreement, and to assume toward the Contractor all the obligations and responsibilities that the Contractor, by this Agreement, assumes toward the Owner and Perkins&Will. The undersigned Contractor assumes responsibility for the breach of this Agreement by any Subcontractor to whom the Contractor distributes the Model Files.

Upon return receipt of this signed Agreement, the Model Files will be transmitted to the undersigned through electronic mail, or be posted on the Perkins&Will file transfer protocol site or the Project web site.

This Agreement may be executed in counterpart, and the parties agree that the individual counterparts, taken together, shall constitute a binding agreement.

The undersigned agrees that they are authorized to bind the company indicated below to the obligations of this Agreement, and understands that Perkins&Will is relying upon this representation in agreeing to enter into this Agreement. In addition to any rights that Perkins&Will may have against the company, the undersigned agrees that Perkins&Will shall have rights personally against the undersigned if this apparent authority is questioned or disputed by the company in any way.

The undersigned agrees that any violation of this Agreement by the undersigned or the company, or any of the agents, representatives, officers, or employees of either, will result in irreparable harm to Perkins&Will that cannot be entirely compensated by money damages. Therefore, the undersigned and the company agree that Perkins&Will may seek any and all equitable remedies that may be available to Perkins&Will, including but not limited to a temporary or permanent injunction in the event of any breach or threatened breach of the terms of this Agreement.

The undersigned shall reimburse Perkins&Will for any cost or expense, including attorney's fees and all labor and expenses (including those of in-house counsel), related to the enforcement of the terms of this Agreement.

Perkins&Will	***Acknowledged and Accepted***
Signature	*Signature of Recipient*
Name	*Name*
Title	*Company*
Date	*Title*

END OF AGREEMENT

SUBMITTAL TRANSMITTAL

SUBMITTAL NUMBER:

__ __ __ __ __ __ - __ __ __

Spec. Section
Sequence Number
Re-submittal Letter

PROJECT: _____

_____

P&W Proj. No: _____

SPECIFICATION SECTION:

Number: _____

Title: _____

DESCRIPTION OF PRODUCT:

_____

NOTES:

1. Submittal Transmittal to Architect indicates Construction Manager's, Contractor's, and Subcontractor's Approval of Submittal.
2. This Transmittal Form shall stay with Submittal throughout routing. Copy for your file.

ROUTING SEQUENCE	CHECKED BY	DATE REC'D.	DATE SENT	No. of COPIES	ACTION TAKEN*
SUBCONTRACTOR OR VENDOR		N/A			A (See Note 1 above)
CONTRACTOR					A (See Note 1 above)
ARCHITECT					
CONSULTANT					
ARCHITECT					
CONTRACTOR					
SUBCONTRACTOR OR VENDOR			N/A		
OWNER	N/A		N/A		N/A

ACTION LEGEND: (*Indicate in ACTION TAKEN column above.)

A - NO EXCEPTIONS
B - EXCEPTIONS AS NOTED
C - REVISE AND RESUBMIT
D - REJECTED
E - FOR INFORMATION ONLY
F - NOT REVIEWED
1 Submittal is not required.
2 Submittal was not reviewed by Contractor.

REMARKS:

[ ] SEE ATTACHED COMMENTS

[ ] SEE ENCLOSED SUBMITTAL FOR COMMENTS

[ ] LANGUAGE ON CONTRACTOR'S SUBMITTAL STAMP IS NOT CONSISTENT WITH CONTRACT REQUIREMENTS

_____

_____

_____

SECTION 01 40 00

QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
   1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
   2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
   3. Specific test and inspection requirements are not specified in this Section.

C. Related Requirements:
   1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.2 DEFINITIONS

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

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

C. 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.

D. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selections made under Sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Mockups establish the standard by which the Work will be judged.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

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

G. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
   1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

1.3 CONFLICTING REQUIREMENTS

A. Referenced Standards: 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 conflicting requirements that are different, but apparently equal, to Architect 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 Architect for a decision before proceeding.

1.4 DELEGATED DESIGN

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.

1.5 INFORMATIONAL SUBMITTALS

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

1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, 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.

1.6 REPORTS AND DOCUMENTS

A. 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, and telephone number 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 whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

B. 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, and telephone number 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 whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

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

1.7 QUALITY ASSURANCE

A. General: 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, 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. Where required by individual Specification Sections, Installer employing workers trained and approved by manufacturer, Installer being acceptable to manufacturer, and/or Installer being an authorized representative of manufacturer for both installation and maintenance.

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 are 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 shall satisfy qualification requirements indicated and engaged in the activities indicated.
   1. Requirements of authorities having jurisdiction supersede requirements for specialists.

G. 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.

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

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
   1. Contractor responsibilities include the following:
      a. Provide test specimens representative of proposed products and construction.

b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. When testing is complete, remove assemblies; do not reuse materials on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect through Construction Manager 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.

J. Mockups: Refer to individual sections of the Specifications for mockup requirements.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.
3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting 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 inspecting 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. 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 01 33 00 "Submittal Procedures."

D. 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.

E. 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.

F. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
   1. Access to the Work.
   2. Incidental labor and facilities necessary to facilitate tests and inspections.
   3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
   4. Facilities for storage and field curing of test samples.
   5. Delivery of samples to testing agencies.
   6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
   7. Security and protection for samples and for testing and inspecting equipment at Project site.

G. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
   1. Schedule times for tests, inspections, obtaining samples, and similar activities.

H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Coordinate and submit concurrently with Contractor's construction schedule. Submit schedule within 30 days of date established for commencement of the Work. Update as the Work progresses.
   1. Distribution: Distribute schedule to Owner, Architect, Construction Manager, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. 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, and Construction Manager's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
   1. Provide materials and comply with installation requirements specified in other Specification Sections 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 01 73 00 "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

SECTION 01 42 00

REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract, without any implied meaning extending the Architect's responsibility into the Contractor's area of Contractor coordination, supervision, or means and methods of construction as outlined in the Conditions of the Contract.
   1. In no situation will an approval by Architect release Contractor from responsibility to fulfill requirements of the Contract Documents.

C. “Authorities Having Jurisdiction” (AHJ): Means the agencies, either individually or collectively, charged by statute with administration and enforcement of the requirements of building codes and other regulations at the Project location.

D. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

E. “General Requirements”:
   1. Drawings and general provisions of the Contract, including General and Supplementary Conditions (if any) and other Division 01 General Requirement Sections, apply to all sections of the work.
   2. The provisions or requirements of Division 01 Sections apply to entire Work of the Contract and where so indicated, to other elements which are included in the Project.

F. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

G. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

H. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

I. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

J. "Provide": Furnish and install, complete and ready for the intended use.

K. "Installer": Means the Contractor or other entity engaged by Contractor as an employee, subcontractor, or sub-subcontractor to perform a particular construction operation at the Project site, including preparation, erection, installation, application, construction, re-installation, and similar operations required for execution of the Work.
   1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
   2. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to trades people of the corresponding generic name.

L. "Project Site": Space available for performing construction activities. The extent of Project site is shown an a coordinated logistics plan provided by the Construction Manager and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
   1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.3 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Conflicting Requirements: Where 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 Architect for a decision before proceeding.
   1. 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.

2. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to Architect for a decision before proceeding.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:

1.2 DEFINITIONS

A. Permanent Enclosure: As determined by Architect, includes as a minimum, the following:
   1. Permanent or temporary roofing is complete, insulated, and weathertight, including parapets and roof edge terminations.
      a. Roof insulation is fully protected from getting wet.
      b. Roof drains are fully functional.
   2. Exterior walls are insulated, weathertight, and UV-resistant.
   3. All openings are closed with permanent construction or substantial weathertight temporary closures.
   4. Permanent enclosure envelope shall be capable of retaining controlled interior temperature and humidity levels.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities 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. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections, backflow preventers, and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

D. Sewer, Water, and Electric Power Service: For new service or service not available on-site for construction operations, contractor shall be responsible for providing and paying for use and accommodations.

1.4 INFORMATIONAL SUBMITTALS

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

B. Implementation and Termination Schedule: Within **15** days of date established from commencement of the Work, submit schedule indicating implementation and termination dates of each temporary utility.

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

D. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

E. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
   1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
   2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
   3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

F. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
   1. Locations of dust-control partitions at each phase of work.
   2. HVAC system isolation schematic drawing.
   3. Location of proposed air-filtration system discharge.
   4. Waste handling procedures.
   5. Other dust-control measures.

G. Noise and Vibration Control Plan: Identify construction activities that may impact the occupancy and use of existing spaces within the building or adjacent existing buildings, whether occupied by others, or occupied by the Owner. Include the following:
1. Methods used to meet the goals and requirements of the Owner.
2. Concrete cutting method(s) to be used.
3. Location of construction devices on the site.
4. Show compliance with the use and maintenance of quieted construction devices for the duration of the Project.
5. Indicate activities that may disturb building occupants and that are planned to be performed during non-standard working hours as coordinated with the Owner.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines.

1.6 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 MATERIALS

A. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts.

B. Lumber and Plywood: Comply with requirements in Section 06 10 00 – Rough Carpentry.

C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

D. Dust-Control Adhesive-Surface Walk-off Mats: Provide mats minimum 36 by 60 inches (914 by 1624 mm).

E. Insulation: Unfaced mineral-fiber blanket, manufactured from glass, slag wool, or rockwool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively.

F. Paint: Comply with requirements in Division 09 Section "Painting."

G. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Owner will provide office space for contractor use within the existing facility as designated by Construction Manager.

B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.
   1. Store combustible materials apart from building.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
   1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

B. Self-Contained Toilet Units: Single-occupant units of chemical, aerated recirculation, or combustion type; vented; fully enclosed with a glass-fiber-reinforced polyester shell or similar nonabsorbent material.

C. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
   1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
   2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction and marked for intended location and application.
   3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8

at each return-air grille in system and remove at end of construction and clean HVAC system as required in Section 01 77 00 "Closeout Procedures".

D. Electrical Outlets: Properly configured, NEMA-polarized outlets to prevent insertion of 110- to 120-V plugs into higher-voltage outlets; equipped with ground-fault circuit interrupters, reset button, and pilot light.

E. Power Distribution System Circuits: Where permitted and overhead and exposed for surveillance, wiring circuits, not exceeding 125-V ac, 20-A rating, and lighting circuits may be nonmetallic sheathed cable.

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.

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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash 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.
   1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use. Facilities for use are limited to restrooms within the Project Boundary and not in occupied portions of the building.

E. Temporary Heating: Provide temporary heating required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.
   1. Provide temporary dehumidification systems when required to reduce ambient and substrate moisture levels to level required to allow installation or application of finishes and their proper curing or drying.

F. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
   1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
      a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
      b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
   2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
   3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

G. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
   1. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes.

H. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
   1. Connect temporary service to Owner's existing power source, as directed by Owner.

I. Electric Distribution: Provide receptacle outlets adequate for connection of power tools and equipment.
   1. Provide waterproof connectors to connect separate lengths of electrical power cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage ratio.
   2. Provide warning signs at power outlets other than 110 to 120 V.
   3. Provide metal conduit, tubing, or metallic cable for wiring exposed to possible damage. Provide rigid steel conduits for wiring exposed on grades, floors, decks, or other traffic areas.
   4. Provide metal conduit enclosures or boxes for wiring devices.
   5. Provide 4-gang outlets, spaced so 100-foot (30-m) extension cord can reach each area for power hand tools and task lighting. Provide a separate 125-V ac, 20-A circuit for each outlet.

J. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
   1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

K. Electronic Communication (E-mail) Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.
   1. Provide broadband in primary field office.
   2. Provide for connection of communication devices Owner, Architect and Contractor by Wi-Fi, or wired connections.

3.4 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
   1. Utilize designated area within existing building for temporary field offices.
   2. 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 Logistics Plan provided by Construction Manager.

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

C. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.
   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Section 31 20 00 "Earth Moving."
   3. Recondition base after temporary use, including removing contaminated material, regrading, proof-rolling, compacting, and testing.

D. 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.

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

F. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
   1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
   2. Remove snow and ice as required to minimize accumulations.

G. Project Signs: Unauthorized signs are not permitted.
   1. Identification Signs: Construction Manager to provide Project identification signs and coordinate design and location with the Owner.
   2. Temporary Signs: Provide other signs as required to inform public and individuals seeking entrance to Project.
      a. Provide temporary, directional signs for construction personnel and visitors.
   3. Maintain and touchup signs so they are legible at all times.

Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Section 01 73 00 "Execution."

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.
   1. Comply with work restrictions specified in Section 01 10 00 "Summary."

C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings, requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
   1. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross tree- or plant- protection zones.
   2. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
   3. Clean, repair, and restore adjoining properties and roads affected by erosion and sedimentation from Project site during the course of Project.
   4. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

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. Tree and Plant Protection: Comply with requirements specified in Section 01 56 39 "Temporary Tree and Plant Protection."

F. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion.

G. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

H. Site Enclosure Fence (**Contractor provided and maintained, paid for by Owner allowance)**: Before construction operations begin, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
   1. Extent of Fence: As indicated on Site Logistics Plan provided by Construction Manager.
   2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

I. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Coordinate and provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

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

K. Temporary Egress: Maintain temporary egress from existing occupied facilities as directed by the Construction Manager, and/or as required by authorities having jurisdiction.

L. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.
   1. Construct covered walkways using scaffold or shoring framing.
   2. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
   3. Paint and maintain appearance of walkway for duration of the Work.

M. 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.

N. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner and tenants from fumes and noise.
   1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
   2. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
   3. Insulate partitions to control noise transmission to occupied areas.
   4. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
   5. Protect air-handling equipment.
   6. Provide walk-off mats at each entrance through temporary partition.

O. Temporary Fire-Rated Partitions: Erect and maintain dustproof fire-rated partitions and temporary enclosures to limit dust and dirt migration and to separate occupied areas from construction, fumes, and noise. Fire-rated partitions shall be provided to separate existing occupied areas from construction areas in accordance with NFPA 241.
   1. Construct fire-rated dustproof partitions of not less than nominal 4-inch (100-mm) studs, 5/8-inch (16 mm) Type X gypsum wallboard on both sides, with joints taped.
   2. Extend partitions up to underside of existing structure to the greatest extent possible.
   3. Insulate partitions to provide noise protection to occupied areas.
   4. Seal joints and perimeter with fire-resistant joint sealant.
   5. Equip partitions with dustproof doors and security locks.
      a. Protect openings in 1-hour fire-rated partitions with 45-minute hollow metal or solid core wood doors.
   6. Protect air-handling equipment.
   7. Weatherstrip openings.

P. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
   1. Provide fire extinguishers, installed on walls on mounting brackets, visible and accessible from space being served, with sign mounted above.
      a. Field Offices: Class A stored-pressure water-type extinguishers.
      b. Other Locations: Class ABC dry-chemical extinguishers or a combination of extinguishers of NFPA-recommended classes for exposures.
      c. Locate fire extinguishers where convenient and effective for their intended purpose; provide not less than one extinguisher on each floor at or near each usable stairwell.
   2. Store combustible materials in containers in fire-safe locations.
   3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for firefighting. Prohibit smoking in hazardous fire-exposure areas.

4. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition.
5. Permanent Fire Protection: At earliest feasible date in each area of Project, complete installation of permanent fire-protection facility, including connected services, and place into operation and use. Instruct key personnel on use of facilities.
6. Develop and supervise an overall fire-prevention and first-aid fire-protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
7. Prohibit smoking in construction areas.
8. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
9. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
10. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.6 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: 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.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
   1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
   2. Keep interior spaces reasonably clean and protected from water damage.
   3. Periodically collect and remove waste containing cellulose or other organic matter.
   4. Discard or replace water-damaged material.
   5. Do not install material that is wet.

6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
   a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
   b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
   c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours.

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. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01 77 00 "Closeout Procedures."

END OF SECTION

SECTION 01 60 00

PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. 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. Document 00 26 00 "Procurement Substitution Procedures" for requests for substitutions during bidding / procurement period.
2. Section 01 21 00 "Allowances" for products selected under an allowance.
3. Section 01 23 00 "Alternates" for products selected under an alternate.
4. Section 01 25 00 "Substitution Procedures" for requests for substitutions after bid /pricing.
5. Section 01 42 00 "References" for applicable industry standards for products specified.

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. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved through submittal process 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. Evaluation of 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. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

1.3 ACTION SUBMITTALS

A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
   1. Identification of basis-of-design product, fabrication, or installation method to be replaced, including Specification Section number and title, and Drawing numbers and titles.

B. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

C. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 01 33 00 "Submittal Procedures." Show compliance with requirements.

D. Substitution: Refer to Section 01 25 00 “Substitution Procedures” for definition and limitations on substitutions.

1.4 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. Each Contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
2. If a dispute arises between Contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.5 COORDINATION

A. Coordinate affected Work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 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.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Provide a secure location and enclosure at location approved by Owner for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
5. Store cementitious products and materials on elevated platforms.
6. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
7. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
8. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's

disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. 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 with the Specifications, prepare a written document using indicated form properly executed.
3. See other Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Section 01 77 00 "Closeout Procedures."

1.8 PROHIBITION ON INCORPORATION OF HAZARDOUS MATERIALS

A. Owner is responsible for ascertaining that materials within the existing facility, which will be disturbed as part of the work, are free of asbestos containing materials and for performing surveys and/or providing certifications attesting regarding this.

B. Architect and its consultants have not knowingly specified for incorporation into the work, materials or products containing hazardous materials or toxic substances (including asbestos).

C. Contractor (including its subcontractors, sub-subcontractors, and material suppliers/fabricators under its control) is prohibited from incorporating any material or products into the work containing hazardous materials or toxic substances.

D. As part of completed materials and products list required herein, Contractor shall assemble, for the Owner’s records, the Material Safety Data Sheets (MSDS) for all materials and products incorporated into the work. These MSD sheets shall be updated upon final completion of the work to incorporate changes which have occurred during the course of the work due to approved substitution requests and other modifications. Architect will not review, nor approve, the MSD sheets. The Contractor, also as a pre-requisite to achieving final completion, shall provide a certificate to the Owner indicating that no hazardous or toxic materials or products were incorporated into the work.

E. Architect and its consultants are not responsible for the presence of hazardous materials or toxic substances in or around the work, nor the exposure to persons

who construct or subsequently occupy the work. The Architect will not provide certifications regarding the presence or absence of such materials or substances.

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 not in conflict with 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 the Specifications establish salient characteristics of products.

B. Product Selection Procedures:
   1. 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 unless approved by the Architect.
      a. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
   2. 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. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.
   3. Products:
      a. Restricted List: 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 when submitted in accordance with the provisions of Section 01 25 00.

4. Manufacturers:
    a. Restricted List: 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 when submitted in accordance with the provisions of Section 01 25 00.
5. Available Manufacturers: Where Specification paragraphs or subparagraphs titled "Available Manufacturers" introduce a list of manufacturers' names, provide a product by one of the manufacturers listed or another manufacturer that complies with requirements. Comply with provisions in "Comparable Products" Article to obtain approval for use of an unnamed product.
6. Product Options: Where Specification paragraphs titled "Product Options" indicate that size, profiles, and dimensional requirements on Drawings are based on a specific product or system, provide either the specific product or system indicated or a comparable product or system by another manufacturer.
    a. Submitted in accordance with provisions of Section 01 25 00.
7. 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 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. Substitutions may be considered, unless otherwise indicated, when submitted in accordance with provisions of Section 01 25 00.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
    1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 01 25 00 "Substitution Procedures" for proposal of product.

D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that does not include premium items.
2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from manufacturer's product line that includes both standard and premium items.
3. Full Industry Range: Where Specifications include the phrase "full industry range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, or texture from any listed manufacturer's product line that includes both standard and premium items.
4. "Custom Color as selected by Architect" or "to match color on file in Architect's office", "match Architect's sample" means that the color selected is custom and requires custom formulations and submissions of color to obtain Architect's approval prior to application.

E. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 01 for allowances that control product selection and for procedures required for processing such selections.

2.2 COMPARABLE PRODUCTS

A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

B. Submitted in accordance with provisions of Section 01 25 00.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 73 00

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. Field engineering and surveying.
   3. Installation of the Work.
   4. Coordination of Owner-installed products.
   5. Progress cleaning.
   6. Starting and adjusting.
   7. Protection of installed construction.

B. Related Requirements:
   1. Section 01 10 00 "Summary" for limits on use of Project site.
   2. Section 01 33 00 "Submittal Procedures" for submitting surveys.
   3. Section "01 73 29 "Cutting and Patching".
   4. Section 01 77 00 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
   5. Section 02 41 19 "Selective Demolition" for demolition and removal of selected portions of the building.
   6. Section 07 84 13 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.2 DEFINITIONS

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

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

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For land surveyor.

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

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

D. Certified Surveys: Submit two copies signed by land surveyor.

E. Final Property Survey: Submit 2 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 products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.
   1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with requirements in Section 01 81 13 "Sustainable Design Requirements"

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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examination of the Site and Records of Existing Construction and Conditions: Examine the site, the records of existing construction, and the conditions under which the Work is to be performed. Notify the Architect immediately if existing conditions discovered will affect the Work as shown on the Contract Documents

B. 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, 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.

C. Existing Conditions Depicted in the Contract Documents: The Contract Documents are based upon the information furnished to the Architect by the Owner. Such information is available from the Owner. The records are furnished for information only and may not represent all conditions that will be encountered. The records of existing construction represent conditions known to the Owner. Other construction, of which no records are available, may be encountered. Dimensions of existing construction are based on information provided to the Architect by the Owner. The Contractor and each subcontractor shall field verify dimensions of existing conditions.

D. 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.

E. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
2. List of detrimental conditions, including substrates.
3. List of unacceptable installation tolerances.
4. Recommended corrections.

F. 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 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 caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 01 31 00 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

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

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
   1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
   2. Establish limits on use of Project site.
   3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
   4. Inform installers of lines and levels to which they must comply.
   5. Check the location, level and plumb, of every major element as the Work progresses.
   6. Notify Architect and Construction Manager when deviations from required lines and levels exceed allowable tolerances.
   7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

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

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

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

3.4 FIELD ENGINEERING

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

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
   1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Construction Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need

to relocate permanent benchmarks or control points to Architect and Construction Manager before proceeding.

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

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
   1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
   2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
   3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

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

E. Final Property Survey: Engage a land surveyor to prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
   1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
   2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
   4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces.

B. Precautions Against Movement or Settlement: The Contractor shall take precautions, including bracing, shoring, underpinning, or other retaining structures, to guard against movement or settlement of existing or new construction. Assume responsibility for the design, safety, and support of such construction, and for movement, settlement, damage, or injury resulting from the construction.

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

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

E. 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.

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

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

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

I. 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.
   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.

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

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

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
   1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
   2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: 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 (27 deg C).
   3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to 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 according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

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

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

G. Waste Disposal: 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 01 74 19 "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 assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 01 91 13 "General Commissioning Requirements."

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

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

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

E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 40 00 "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

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

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

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes general administrative and procedural requirements for cutting and patching.

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.

C. Cutting and patching is performed for coordination of the Work, to uncover Work for access or inspection, to obtain samples for testing, to permit alterations to be performed or for other similar purposes.

D. Restoring or removing and replacing non-complying work is specified separately from cutting-and-patching but may require cutting-and-patching operations as specified herein.

1.3 PREINSTALLATION MEETING

A. Cutting and Patching Conference: Conduct conference at Project site.
   1. Coordinate with Owner if Cutting and Patching Conference will be required.
   2. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
      a. Contractor's superintendent.
      b. Trade supervisor responsible for cutting operations.
      c. Trade supervisor(s) responsible for patching of each type of substrate.
      d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
   3. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.4 SUBMITTALS

A. Cutting and Patching Plan: Submit plan describing procedures at least **10** days prior to the time cutting and patching will be performed. Include the following information:
   1. Coordinate with Owner if Cutting and Patching Plan will be required.
   2. Extent: Describe reason for and extent of each occurrence of cutting and patching.

3. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
4. Products: List products to be used for patching and firms or entities that will perform patching work.
5. Dates: Indicate when cutting and patching will be performed.
6. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be relocated and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
    a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.

1.5 QUALITY ASSURANCE

A. Comply with requirements for and limitations on cutting and patching of construction elements.
    1. Structural Elements: When cutting and patching structural elements, or when encountering the need for cutting and patching of elements whose structural function is not known, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection.
    2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
    3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
    4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

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

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 Owner and Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.

C. Materials to be cut and patched include those damaged by the performance of the Work.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
   1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
   2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

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

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

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

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

E. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage

elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as 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.
   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.

D. Fire Rated Construction: At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 84 13 "Penetration Firestopping", to full thickness of the penetrated element.

E. Roofing: Where penetrations are made through the roof system to accommodate mechanical, electrical, or plumbing systems, or any other reason associated with the Work, repair in accordance with the original manufacturer's requirements. Install curbs, cants, flashing and other roof system components in accordance with Specifications within this Project Manual and recommendations by the manufacturer of the roof system presently in place. Return assembly to weather-tight condition. Also refer to Division 07 section on roof modifications or repairs.

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

END OF SECTION

SECTION 01 74 19

CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

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

B. Related Requirements:
   1. Section 02 41 19 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.

1.2 DEFINITIONS

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

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

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

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

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

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

G. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

H. Waste Management Plan: A project-related plan for the collection, transportation and disposal of waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material becoming landfill.

1.3 ACTION SUBMITTALS

A. Waste Management Plan: Submit plan prior to commencement of the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Include the following information:
   1. Material category.
   2. Generation point of waste.
   3. Total quantity of waste in tons.
   4. Quantity of waste salvaged, both estimated and actual in tons.
   5. Quantity of waste recycled, both estimated and actual in tons.
   6. Total quantity of waste recovered (salvaged plus recycled) in tons.
   7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

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

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

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

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

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

G. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

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

B. Waste Management Conference(s): Discuss waste management plan during preconstruction conference. Review methods and procedures related to waste management including, but not limited to, the following:
   1. Review and discuss waste management plan including responsibilities of each contractor and waste management coordinator.
   2. Review requirements for documenting quantities of each type of waste and its disposition.
   3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
   4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
   5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop a waste management plan in accordance with Owner requirements.

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

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

D. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
   1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work in compliance with Section 02 41 19 "Selective Demolition."
   2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
   3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
   4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

E. Cost/Revenue Analysis: Indicate total cost of waste disposal as if there were no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:
1. Total quantity of waste.
2. Estimated cost of disposal (cost per unit). Include transportation and tipping fees and cost of collection containers and handling for each type of waste.
3. Total cost of disposal (with no waste management).
4. Revenue from salvaged materials.
5. Revenue from recycled materials.
6. Savings in transportation and tipping fees by donating materials.
7. Savings in transportation and tipping fees that are avoided.
8. Handling and transportation costs. Include cost of collection containers for each type of waste.
9. Net additional cost or net savings from waste management plan.

1.7 PROJECT MEETINGS

A. Waste management plans and implementation shall be discussed at the following meetings:
1. Pre-demolition meeting.
2. Pre-construction meeting.
3. Regular job-site meetings.
4. Subcontractor toolbox meetings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Practice efficient waste management in the use of materials in the course of the Work. Use reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work.
   1. Distribute waste management plan to everyone concerned within three days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. 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. If applicable, designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
   2. Comply with Section 01 50 00 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General:
   1. If applicable, comply with Owner’s recycling program.
   2. Recycle as much non-hazardous demolition and construction waste material as possible.
      a. Recycle paper and beverage containers used by on-site workers.

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

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Maintain materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to the recycling process.

D. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
   1. Provide appropriately marked containers or bins for controlling recyclable waste until removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
      a. Inspect containers and bins for contamination and remove contaminated materials if found.
   2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:
1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION

SECTION 01 77 00

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. Warranties.
   4. Final cleaning.
   5. Repair of the Work.

B. Related Requirements:
   1. Section 01 31 00 “Project Management and Coordination” for Web-based Project Information Management System.
   2. Section 01 73 00 "Execution" for progress cleaning of Project site.
   3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   4. Section 01 78 39 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
   5. Section 01 79 00 "Demonstration and Training" for requirements for instructing Owner's personnel.
   6. Divisions 03 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.2 DEFINITIONS

A. List of Incomplete Items: Contractor prepared list of items to be completed or corrected, prepared for the Architect’s use prior to Owner, Owner’s Agent, and Architect’s inspection (Design Team Punchlist), to determine if the Work is substantially complete.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at time of request for Substantial Completion Inspection.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. "Substantial Completion" is the stage in the progress of Work when Work or designated portion thereof is sufficiently complete in accordance with Contract Documents so Owner can occupy or utilize Work for use which it is intended.
   1. Work will not be considered suitable for Substantial Completion review until all systems and equipment are operational; all designated or required governmental inspections and certifications have been made and posted, designated instruction of Owner's personnel in operation of systems and equipment has been completed, operation and maintenance data has been satisfactorily turned over to the Owner, and all finishes are in place. In general, the only remaining Work shall be minor in nature, such that the Owner could occupy project or designated portion thereof on following day, and completion of Work by Contractor would not materially interfere or hamper Owner's normal business operations.
   2. Contractor shall certify that all remaining Work will be completed within a reasonable time, agreed upon by Owner, following date of Substantial Completion. Failure of the Contractor to complete the Work within the stipulated time shall automatically re-institute the provisions for liquidated damages due Owner as contained elsewhere in Contract Documents, or as provided by law for such period of time as may be required by Contractor to fully complete Work whether Owner has occupied the Project or not.

B. Contractor's List of Incomplete Items: Using Web-based Project Information Management Systems, 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.

C. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
   1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.

a. Accessibility standard inspection for compliance with ANSI A117.1, Americans with Disabilities Act Accessibility Guidelines (ADAAG) and local requirements if more stringent.

2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Construction Manager. Label with manufacturer's name and model number where applicable.
5. Submit test/adjust/balance records.
6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

D. Procedures Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 01 79 00 "Demonstration and Training."
6. Prepare and submit Project Record Documents, operation and maintenance manuals, Final Completion construction photographs and photographic negatives, damage or settlement surveys, property surveys, and similar final record information.
7. Advise Owner of changeover in heat and other utilities.
8. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

E. 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 and the Contractor’s list of incomplete items, 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 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 according to Section 01 29 00 "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 shall 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. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

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. Use CSI Form 14.1A or substantially similar form, and forward to Architect at time of request for Substantial Completion inspection. Architect may use same form for Architect’s supplemental items to Contractor.
   1. Organize list of spaces in sequential order, starting with exterior areas first.
   2. Organize items applying to each space by major element, including categories for ceiling, 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. PDF electronic file. Architect through Construction Manager will return annotated file.

1.9 ACCESSIBILITY STANDARD INSPECTION

A. Provide inspection at Substantial Completion of facility in accordance with rules and regulations of the Americans with Disabilities Act Accessibility Guidelines (ADAAG) for the purpose of determining compliance with ADAAG. Inspector must be licensed with the state fire marshal to perform the required inspection.

B. Upon receipt of Inspector's report, immediately make corrections of any reported non-compliant items. Provide documentation to Owner of completed corrective measures.

1.10 OPERATION AND MAINTENANCE MANUALS

A. Refer to Section 01 78 23.

1.11 PROJECT RECORD DOCUMENTS

A. Refer to Section 01 78 39.

1.12 SUBMITTAL OF PROJECT WARRANTIES

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

B. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.
1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

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 final acceptance for entire Project or for a designated portion of Project:
   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.

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

C. Pest Control: Comply with pest control requirements in Section 01 50 00 "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Section 01 74 19 "Construction Waste Management and Disposal.

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
   1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
   2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
      a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
   3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
   4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION

SECTION 01 78 23

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.
   2. Emergency manuals.
   3. Operation manuals for systems, subsystems, and equipment.
   4. Product maintenance manuals.
   5. Systems and equipment maintenance manuals.

B. Related Requirements:
   1. Section 01 33 00 "Submittal Procedures" for submitting copies of submittals for 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. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed 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 operations and maintenance submittals are acceptable.
   2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:
   1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
      a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
      b. Enable inserted reviewer comments on draft submittals.

C. Initial Manual Submittal: Submit draft copy of each manual at least **15** days before commencing demonstration and training. Architect will comment on whether general scope and content of manual are acceptable.

1.4 COORDINATION

A. Where operation and maintenance documentation include information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
   1. List of documents.
   2. List of systems.
   3. List of equipment.
   4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. 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.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

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 according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain 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. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
9. 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. 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: Enable bookmarking of 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.

2.3 EMERGENCY PROCEDURES MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

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

C. 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.

D. 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.

2.4 OPERATION AND MAINTENANCE MANUALS

A. 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.

B. 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.

C. 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.

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

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

2.5 PRODUCT MAINTENANCE MANUALS

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

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

C. Product Information: Include the following, as applicable:
1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. 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.

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

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

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

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer

or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
   1. Test and inspection instructions.
   2. Troubleshooting guide.
   3. Precautions against improper maintenance.
   4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   5. Aligning, adjusting, and checking instructions.
   6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

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

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

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION (Not Used)

END OF SECTION

SECTION 01 78 39

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:
   1. Record Drawings.
   2. Record Digital Data Files.
   3. Record Specifications.
   4. Record Product Data.
   5. Miscellaneous record submittals.

B. Related Requirements:
   1. Section 00 63 74 "Electronic File Transfer Agreement" for electronic file transfer terms and requirements.
   2. Section 01 77 00 "Closeout Procedures" for general closeout procedures.
   3. Section 01 78 23 "Operation and Maintenance Data" for operation and maintenance manual requirements.
   4. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.2 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:
   1. Initial Submittal:
      a. Submit PDF electronic files of Contractor's paper-copy set(s) of marked-up record prints.
      b. Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
   2. Final Submittal:
      a. Submit PDF electronic files of scanned record prints.
      b. Print each drawing, whether or not changes and additional information were recorded.
   3. Final Submittal:
      a. Submit record digital data files.
      b. Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Model: Comply with Owner's requirements.

C. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

D. 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.

E. 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.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, 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 archive 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 below first floor.
      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 Construction 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 sets in red. 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. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location
   1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. 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 scanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
   3. Note related Change Orders and record Drawings where applicable.

B. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.
   1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

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

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
   1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

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

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

END OF SECTION

SECTION 01 79 00

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.
   3. Descriptions and responsibilities for commissioning demonstration and training requirements.

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.

B. Attendance Record: For each training module, submit list of participants.

1.3 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit within seven days of end of each training module.
   1. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

1.4 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 and Owner.

1.5 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.

1.6 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 01 78 23 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

1.7 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. 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 with at least 10 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 demonstration performance-based test.

F. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

1.8 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

B. Digital Video Recordings:
1. Submit video recording by method acceptable to Owner.
2. File Hierarchy: Organize folder structure and file locations according to 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.

END OF SECTION

SECTION 02 41 00
SITE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included: All demolition, removal, and salvage work as shown on the drawings or specified herein to include, but not necessarily limited to the following:
   1. Pavement removal including asphalt parking lot, concrete sidewalk, concrete curb, parking lot islands, existing concrete utility pads, and other miscellaneous hardscape items.
   2. Stormwater sewer system removal/abandonment including existing catch basins and castings, storm sewer, existing drywells and castings, and existing manholes and castings.
   3. Sanitary sewer system removal/abandonment including removal of existing manholes and castings, clean outs, and abandoning of existing sanitary sewer and laterals.
   4. Removal and abandonment of existing water main, services, vaults, fire department connections, appurtenances, and irrigation related items.
   5. Removal and abandonment of existing gas main, services, and meters.
   6. Removal and abandonment of existing electrical lines, services, transformers, transformer pads, hand holes, and meters.
   7. Removal of existing tree stumps, shrubs, and other various landscaping items.
   8. Removal of brick walls and dumpster enclosures.
   9. Removal of existing bollards.
   10. Removal of existing flag poles.
   11. Removal of existing bike racks.
   12. Removal of existing signage.

B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this Section.

1.2 SUBMITTALS

A. CONTRACTOR shall submit permits and notices, if required, authorizing building demolition.

1.3 QUALITY ASSURANCE

A. CONTRACTOR shall perform demolition, removal, and salvage in conformity with applicable federal, state, and local safety practices and code requirements. CSR: corporate sustainability report.

B. CONTRACTOR shall contact all public utilities and shall shut off, cut and cap all utility services in accordance with utility requirements, codes, rules and regulations.

C. Obtain and pay for all necessary permits, licenses and certificates required.

D. Removal of flammable and combustible liquid storage tanks shall be by a State-certified remover.

E. Flammable and combustible liquid storage tank removal shall be in accordance with all applicable codes including State of Indiana.

1.4 SEQUENCE

A. No demolition, removal, or salvage work shall commence until approval to proceed has been granted by OWNER. Such work shall be completed in accordance with the construction sequence included in Division 01 of these specifications and in accordance with the construction phases of this project and work to be done by other contractors.

B. CONTRACTOR is responsible for appropriate sequencing of removal and abandonment of existing utilities to maintain necessary services to existing building.

PART 2 - PRODUCTS

2.1 GENERAL

A. Compacted fill shall meet the requirements of Section 31 23 00–Excavation, Fill, Backfill and Grading.

B. Pipe fittings and materials shall meet the requirements of Section 33 30 10–Buried Piping and Appurtenances.

PART 3 - EXECUTION

3.1 BREAKING DOWN AND REMOVING STRUCTURES

A. General:
1. All existing structures, with all attached parts and connections, shown on the drawings or specified to be removed or that interfere with the new construction, shall be entirely removed within the limits shown or specified, unless otherwise provided.
2. When a portion of an existing structure is to be retained, CONTRACTOR shall take care during construction operations so as not to impair the value of the retained portion.
    a. Complete all operations necessary for the removal of any existing structure which might endanger the new construction prior to the construction of the new work.
    b. Do not use any equipment or devices which might damage structures, facilities, or property which are to be preserved and retained.

3. When existing reinforcing is exposed at the surface of removal areas, CONTRACTOR shall burn back the reinforcing bars 2 inches and patch with nonshrink grout unless noted otherwise.

B. Pavement, Curb, Gutter, Sidewalk, Driveways, Crosswalk, and Similar Structures:
1. Where portions of the existing structure are to be left in the surface of the finished work, CONTRACTOR shall remove the structure to an existing joint, or saw and chip the structure to a true line.
2. Sufficient removal shall be made to provide for proper grades and connections in the new work.

C. Walls, Piers, Surface Drains, Foundations, and Similar Masonry Structures:
1. Remove entirely or break down to an elevation at least 2 feet below the earth subgrade within the areas of a road bed and elsewhere to 2 feet below the finished slopes or natural ground, as the case may be.
2. Remove existing construction as required to clear new construction.

D. Underground Tanks (Other than Septic Tanks):
1. Remove the contents of underground tanks to allow the complete removal of such tanks.
2. Backfill the resulting hole or pit in accordance with the backfill portion of this section.

3.2 ABANDONING STRUCTURES

A. Tanks, Manholes, Catch Basins, and Inlets:
1. CONTRACTOR shall thoroughly clean structures to be abandoned.
2. CONTRACTOR shall plug existing pipe connections with brick or concrete block masonry or with any grade of concrete having a 28-day compressive strength in excess of 2,000 psi.
3. CONTRACTOR shall remove the walls of the structures to an elevation at least 2 feet below the finished grade line, or to such elevation that may be designated on the drawings or as necessary to clear new construction.

3.3 ABANDONING AND REMOVING UTILITIES AND UNDERGROUND PROCESS PIPING

A. CONTRACTOR shall be responsible for the turning off or unhooking of all utilities before starting the demolition work. Remove all utility lines, including electrical services that are shown or specified to be removed. Remove utility lines that are to be abandoned as needed to clear new construction.

B. The ends of utility lines and process piping shown or specified to be abandoned that are exposed by excavation shall be plugged with concrete to prevent soil infiltration into the pipes.

3.4 EQUIPMENT

A. CONTRACTOR shall remove all equipment specified herein or indicated.

B. CONTRACTOR shall remove associated exposed conduit, power wiring, controls, switches, instrumentation, control wiring, control boxes, appurtenances, and their supports serving equipment to be removed. Electrical items shall be removed to their junction with motor control center, control panel, or their junction with conduit serving other equipment that is to remain.

C. CONTRACTOR shall remove all piping and appurtenances and their supports serving equipment indicated to be removed. Piping shall be removed to its junction with the main service header serving other equipment that is to remain or new equipment as indicated. Remaining piping and tubing shall be fitted with an appropriate blind flange or plug and insulated as required.

D. CONTRACTOR shall remove equipment bases, anchor bolts, and other supports serving equipment to be removed. Concrete bases shall be removed to 1 inch below finished grade and repaired with nonshrink grout plus surfacing to match existing.

E. CONTRACTOR shall patch floors, walls, and ceilings as required to match existing or as indicated where equipment, piping, electrical, bases, or supports are removed near existing building.

F. CONTRACTOR shall remove the following major equipment items or systems. The following list is not intended to be all-inclusive. CONTRACTOR shall remove all items indicated or specified to be removed.
1. Electrical transformer and all associated appurtenances.
2. Gas service meters and all associated appurtenances.
3. Water meter and fire service vaults and all associated appurtenances.

3.5 SALVAGE

A. OWNER has first right of refusal to all material, piping, and equipment removed.

B. All equipment, material, and piping, except as specified hereinafter, within the buildings and structures to be demolished and additional items as noted shall be removed by CONTRACTOR. CONTRACTOR shall inspect each structure and determine the type and amount of equipment, materials, and piping to be removed.

C. All equipment, material, and piping, except as specified hereinafter, within the limits of the demolition and additional items noted to be removed, will become the property of CONTRACTOR if OWNER does not claim under first right of refusal and shall be removed from the project site. Comply with State and local ordinances and regulations for disposing of materials.

3.6 BACKFILL

A. CONTRACTOR shall fill all abandoned structures and excavations resulting from removal of structures and utilities with compacted fill. See Section 31 23 00–Excavation, Fill, Backfill, and Grading for required degree of compaction.

B. Prior to filling, CONTRACTOR shall break one opening in the floor or wall near the base of each compartment to allow groundwater to freely migrate through the structure.

END OF SECTION

SECTION 02 41 16
BUILDING DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Complete building (structure) demolition and removal, including below grade structures and utilities, including but not limited to the following:

1. Demolition and removal of buildings and site improvements.
2. Removing below-grade construction.
3. Disconnecting, capping or sealing, and removing site utilities.

B. Related Sections:

1. Selective demolition: Section 02 41 19.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

1. Adjacent Buildings: Detail special measures proposed to protect adjacent buildings to remain including means of egress from those buildings.

C. Engineering Survey: Submit engineering survey of condition of building.

D. Schedule of Building Demolition Activities: Indicate the following:

1. Detailed sequence of demolition work, with starting and ending dates for each activity.
2. Temporary interruption of utility services.
3. Shutoff and capping or re-routing of utility services.

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

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

A. Comply with laws, ordinances, rules and regulations of governmental authorities having jurisdiction over this part of the Work.

B. In the event that unforeseen conditions or conflicts become known, the Contractor shall notify the Owner and the Architect of such conditions before proceeding with demolition work.

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

D. Regulatory Requirements: Comply with governing EPA notification regulations before beginning demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

E. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be demolished.
2. Review structural load limitations of existing structures.
3. Review and finalize building demolition schedule and verify availability of demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review and finalize protection requirements.
5. Review procedures for noise control and dust control.
6. Review procedures for protection of adjacent buildings.

1.6 PROJECT CONDITIONS

A. Occupancy: Structures to be demolished will be vacated and use discontinued prior to start of work.

B. Buildings immediately adjacent to demolition area will be occupied. Conduct building demolition so operations of occupied buildings will not be disrupted.

1. Provide not less than 72 hours' notice of activities that will affect operations of adjacent occupied buildings.
2. Maintain access to existing walkways, exits, and other facilities used by occupants of adjacent buildings.

a. Do not close or obstruct walkways, exits, or other facilities used by occupants of adjacent buildings without written permission from authorities having jurisdiction.

C. Condition of Structures: Owner assumes no responsibility for actual condition of structures to be demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner insofar as practicable. However, variations within structure may occur by Owner's removal and salvage operations prior to start of demolition work.

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

1. Hazardous materials will be removed by Owner before start of the Work.
2. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Explosives: Use of explosives will not be permitted.

F. Traffic: Conduct demolition operations and removal of debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

G. Do not close or obstruct streets, walks, or other occupied or used facilities without permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

1.7 PROTECTION

A. Provide protection for persons and property in accordance with ANSI/ASSE A10.6 and NFPA 241

B. Provide temporary barricades, canopies, closures, fences, railings, platforms, lights, sheds, and warning signs required to protect the workmen, Owner's personnel, the public and others from injury due to the demolition work. Provide free and safe passage of persons to and from buildings and facilities which are to remain.

C. Repair any damage to property of the Owner which is to remain in use, or that of any person, or persons on or off the site caused by the demolition work without additional expense to the Owner.

D. Maintain regular traffic flow around the site unless otherwise directed by local traffic officials. Verify haul routes with local traffic officials prior to start of demolition work.

E. Provide sheet piling, shoring and bracing as required to protect and guard against movement, settlement or collapse of any adjacent construction, structures, pavements, soils on or off the site and any designated construction to remain.

F. During the demolition work, if any structure or portion thereof, at any time, is considered by governing authorities or the Contractor to be unstable and presents a hazard, the Contractor shall immediately notify the Owner. The Contractor shall take such precautions as necessary to protect and stabilize the construction until permanent conditions are established. If such unstable construction is to be removed, it shall be given priority and be immediately removed.

1.8 FIRE PREVENTION

A. Perform the demolition work in such a manner as to prevent fires. Remove debris promptly. No materials shall be burned on the site.

B. Protect combustible materials against ignition during acetylene cutting operations. Doors and windows shall not be removed, except on floors being demolished. Keep stairways and fire escapes unobstructed and available for use at all times.

C. Instruct Employees in the following:

1. The location of the fire alarm box and telephone and the manner of summoning the Fire Department without delay in the event of fire.

2. The use of hand pumps, hose, water buckets, and other fire extinguishing equipment.
3. Maintenance of fire protection equipment in serviceable condition properly located and identified so that it will be available for immediate use.

D. Comply with requirements of the Owner's insurance company fire prevention requirements.

PART 2 - PRODUCTS

Not used

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting demolition operations.

B. Review Project Record Documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during building demolition operations.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

3.2 PREPARATION

A. Refrigerant: Remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction before starting demolition.

B. Existing Utilities to be Disconnected: Locate, identify, disconnect, and seal or cap off indicated utilities serving buildings and structures to be demolished.

1. Arrange to shut off indicated utilities with utility companies.
2. If removal, relocation, or abandonment of utility services will affect adjacent occupied buildings, then provide temporary utilities that bypass buildings and structures to be demolished and that maintain continuity of service to other buildings and structures.
3. Cut off pipe or conduit a minimum of 24 inches below grade. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing according to requirements of authorities having jurisdiction.

3.3 PROTECTION

A. Existing Facilities: Protect adjacent walkways, loading docks, building entries, and other building facilities during demolition operations. Maintain exits from existing buildings.

B. Existing Utilities to Remain: Maintain utility services to remain and protect from damage during demolition operations.

1. Do not interrupt existing utilities serving adjacent occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction.
2. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and authorities having jurisdiction.

a. Provide at least 72 hours' notice to occupants of affected buildings if shutdown of service is required during changeover.

C. Temporary Protection: Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction and as indicated. Comply with requirements in Section 01 50 00 - Temporary Facilities and Controls.

1. Protect adjacent buildings and facilities from damage due to demolition activities.
2. Protect existing site improvements, appurtenances, and landscaping to remain.
3. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
4. Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
5. Provide protection to ensure safe passage of people around building demolition area and to and from occupied portions of adjacent buildings and structures.
6. Protect walls, windows, roofs, and other adjacent exterior construction that are to remain and that are exposed to building demolition operations.
7. Erect and maintain dustproof partitions and temporary enclosures to limit dust, noise, and dirt migration to occupied portions of adjacent buildings.

D. Remove temporary barriers and protections where hazards no longer exist. Where open excavations or other hazardous conditions remain, leave temporary barriers and protections in place.

3.4 UTILITY SERVICES

A. Protect and maintain existing public utility lines which are to remain in service in such a manner as to avoid interruption of these lines. Cap utility lines terminated by the demolition work in a manner approved by the governmental authorities and utility companies having jurisdiction.

B. Contract and coordinate with governing authorities and utility companies for exact locations of utilities and for the timely termination of services.

C. Disconnecting and sealing indicated utilities before starting demolition operations is part of this work.

3.5 TEMPORARY CLOSURES AND SHORING

A. Provide temporary, 3/4 inch thick exterior grade plywood closures in new and existing exterior wall openings. Provide wood framing in openings of not less than 2 inch x 4 inch wood studs 24 inch on center. Install sealant in plywood sheet joints and abutting construction joints.

B. Provide hinged lockable doors of the same construction as closures at locations shown on the Drawings or as required for access, security and existing.

C. Temporary closures: weathertight and maintained during the work.

D. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of buildings during building demolition.

1. Strengthen or add new supports when required during progress of demolition.

3.6 REMOVAL OF MATERIALS

A. General: Demolish indicated buildings and site improvements completely. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Do not use cutting torches until work area is cleared of flammable materials. Maintain portable fire-suppression devices during flame-cutting operations.
2. Maintain fire watch during and for at least 3 hours after flame cutting operations.
3. Maintain adequate ventilation when using cutting torches.
4. Locate building demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

B. Engineering Surveys: During demolition, perform surveys to detect hazards that may result from building demolition activities.

C. Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations.

D. Provide and employ the services of a certified exterminator. Treat the entire building and areas in accordance with governing authorities and health regulations for rodent and insect control. Maintain rodent and insect control during the building demolition work.

E. Demolish masonry walls in reasonably small sections, using bracing and shoring as necessary to prevent walls from collapsing. Handle structural steel and cast iron members individually. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations. Wet down piled materials and materials being discharged into vehicles. Provide chutes substantially air-tight having canvas discharge ends to control dust. Comply with governing regulations pertaining to environmental protection.

1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

F. Proceed with demolition of structural framing members systematically, from higher to lower level. Complete building demolition operations above each floor or tier before disturbing supporting members on the next lower level.

G. Demolish and remove off site foundation walls, footings, grade beams and basement floor slabs as shown on the Drawings. Do not use demolished building materials as fill for foundation or basement excavations.

H. Erect and maintain an eight foot high chain link fence around open excavations resulting from demolition activities. Provide lockable access gates. Remove fences after completion of filling excavations.

I. Remove materials resulting from the demolition work from the site in such a manner as to avoid creating a nuisance on a daily basis.

J. Take possession of salvageable material and equipment as property of the Contractor and promptly remove from the site. Salvageable materials are not to be sold on the site.

3.7 FILLING BASEMENTS AND VOIDS

A. Completely fill below-grade areas and voids resulting from demolition of structures.

B. Use satisfactory soil materials as defined in ASTM D 2487, consisting of stone, gravel, and sand, free from debris, trash, frozen materials, roots, and other organic matter.

C. Prior to placement of fill materials, ensure that areas to be filled are free of standing water, frost, frozen material, trash, and debris.

D. Place fill materials in horizontal layers not exceeding 6 inches in loose depth. Compact each layer at optimum moisture content of fill material to a density equal to original adjacent ground, but not less than 90 percent density when tested in accordance with ASTM D 1556, unless subsequent excavation for new work is required.

E. After fill placement and compaction, grade surface to meet adjacent contours and to provide flow to surface drainage structures.

3.8 SITE RESTORATION

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

3.9 REPAIRS

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

3.10 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and legally dispose of them in an EPA-approved landfill acceptable to authorities having jurisdiction. Refer to Section 01 74 19 - Construction Waste Management and Disposal, for recycling and disposal of demolition waste.

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

B. Do not burn demolished materials.

3.11 CLEANING

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

B. Clean adjoining public streets, sidewalks, and planting areas of dust, dirt, and debris caused by building demolition operations. These are to be broom clean. Repair or replace items damaged due to demolition work.

END OF SECTION

SECTION 02 41 19
SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Selective demolition work required to remove indicated portions of the existing building construction for installation or construction of the work of other sections. Selective demolition includes but is not necessarily limited to the following:
   1. Exterior walls and roof areas.
   2. Exterior site/loading dock walls and structures.
   3. Exterior canopies.
   4. Interior partitions.
   5. Interior stairs.
   6. Interior ceilings and associated mechanical, electrical, plumbing and fire protection devices and systems.
   7. Interior finishes.

B. Work Not Included: The following items and construction are not included in the selective demolition work and will be accomplished by others after selective demolition:
   1. Hazardous materials removal.
   2. Environmental monitoring.

C. Related Sections:
   1. Cutting and Patching: Section 01 73 29.
   2. Site Excavation, Fill, Backfill and Grading: Section 31 23 00.

1.2 DEFINITIONS:

A. Remove: Remove and legally dispose of items and construction except those indicated to remain the Owner's property.

B. Existing to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during selective demolition and then cleaned and reinstalled in their original locations.

C. Remove and Salvage: Items indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.

D. Remove and Reinstall: Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in the same locations or in locations indicated.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

D. Schedule of selective demolition activities indicating the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of temporary street barricades, building interior partitions and means of egress.

E. Written description of methods for removal and temporary bracing of structural members or supporting construction.

F. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

G. Predemolition Photographs or Video: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

H. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

I. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed selective demolition Work similar to that indicated for this Project.

B. Regulatory Requirements: Comply with laws, ordinances, rules and regulations of governmental authorities having jurisdiction over the demolition work.
   1. Comply with governing EPA notification regulations before starting selective demolition.
   2. Comply with hauling and disposal regulations of authorities having jurisdiction.
   3. Provide protection of persons and property in accordance with NFPA 241.

C. In the event that unforeseen conditions or conflicts become known, notify the Architect of such conditions before proceeding with demolition work.

D. Pre-Demolition Conference: Conduct a conference at the project site to review the conditions on the selective demolition work prior to the start of work. Review methods and procedures related to selective demolition including, but not limited to, the following
   1. Inspect and discuss condition of construction to be selectively demolished.
   2. Review structural load limitations of existing structure.
   3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
   5. Review procedures for notification of building occupants.

1.5 PROTECTION

A. Provide temporary barricades, railings, platforms, lights, etc., required to protect the workers, Owner's personnel, and others from injury due to the selective demolition work. Provide free and safe passage of persons to and from building areas which are to remain.

B. Repair damage caused by the selective demolition work.

C. Maintain regular traffic flow around the building areas unless otherwise directed.

D. Provide shoring and bracing necessary to protect existing building construction to remain from damage by movement or collapse during the selective demolition operations. Maintain shoring and bracing until completion of work, remove when no longer required.

E. Notify the Owner of any structure or portion thereof, that is unstable or presents a hazard, immediately. Take such precautions as necessary to protect and stabilize the construction until permanent conditions are established.

F. Existing Construction:

1. Provide protection and maintain the existing roof membrane, roof drains, connecting storm sewer piping and roof mounted skylights to remain in place during the demolition work.
2. Provide and maintain protection of the existing exterior windows and glazing to remain in place during the selective demolition work.

1.6 FIRE PREVENTION

A. Perform the demolition work in such a manner as to prevent fires. Remove debris promptly. Do not burn materials on the site.

B. Protect combustible materials against ignition during acetylene cutting operations. Keep stairways and fire escapes unobstructed and available for use at all times.

C. Instruct employees in the following:
1. The location of the fire alarm box and telephone.
2. The manner of summoning the fire department without delay in the event of fire.
3. The use of hand pumps, hose, water buckets and other fire extinguishing equipment.
4. Maintenance of fire protection equipment in serviceable condition properly located and identified so that it will be available for immediate use.

1.7 PROJECT CONDITIONS

A. The Drawings indicate existing construction diagrammatically. Verify at the project site exact locations, sizes, extent, quantities and conditions of the existing construction to be removed or to remain.

B. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

C. Maintain access to existing walkways, corridors, paths of egress, exit ways and other adjacent occupied or used facilities.
1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

D. Owner assumes no responsibility for condition of areas to be selectively demolished.
1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
2. Before selective demolition, Owner will remove the following items:

E. Conditions not indicated in the Contract Documents nor on Drawings of existing construction, which are not observable or otherwise determinable without the use of uncommon equipment and procedures and which subsequently affect the scope or time of the work, may be considered to represent a change in the work.

F. Hazardous Materials: It is expected that hazardous materials will not be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner. Hazardous materials will be removed by Owner under a separate contract.

1.8 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials become the Contractor's property and are to be removed from the site with further disposition at the Contractor's option.

B. Storage or sale of removed items or materials on-site will not be permitted.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.
   1.
   2. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces.
   3. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with the intended function or design are encountered, investigate and measure the nature and extent of the conflict. Promptly submit a written report to the Architect.

E. Survey the condition of the building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during selective demolition.

3.2 PREPARATION AND PROTECTION

A. Employ a certified, licensed exterminator to treat building and to control rodents and vermin before and during selective demolition operations.

B. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

C. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways, where required by authorities having jurisdiction.
   1. Protect existing site improvements, appurtenances, and landscaping to remain.
   2. Erect a plainly visible fence around drip line of individual trees or around perimeter drip line of groups of trees to remain.
   3. Provide temporary weather protection, during interval between demolition and removal of existing construction, on exterior surfaces and new construction to ensure that no water leakage or damage occurs to structure or interior areas.
   4. Protect walls, ceilings, floors, and other existing finish work that are to remain during selective demolition operations.
   5. Cover and protect furniture, furnishings, and equipment that have not been removed.

D. Protection of Areas In Use: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
   1. Provide dust-tight partitions between areas where demolition work is being performed and areas which are finished, not in use, or other building and tenant areas.
   2. Provide not less than 2 inches x 4 inches wood stud partitions with 1/4 inch plywood sheeting. Seal joints of sheeting airtight. Seal perimeter joints of partitions to the adjoining existing construction.
   3. Provide hinged lockable doors of same construction as partitions. Provide doors of adequate size to allow for access and passage of workers, equipment, and materials.

3.3 UTILITY SERVICES

A. Protect and maintain existing and temporary utility lines which are to remain in service in such a manner as to avoid interruption of these lines. Cap utility lines terminated by the selective demolition work.

B. Coordinate locations of existing utility and building services located in walls, floors and ceilings prior to the start of work. Record such utilities and services on as-built record drawings.

3.4 BRACING AND SHORING

A. Locate bracing and shoring to clear columns, floor framing construction and other permanent work. If necessary to move a brace or shore, install new bracing or shore prior to removal of the original.

B. Install internal bracing, if required, to prevent spreading or distortion to braced frames and shores.

C. Remove bracing and shoring not required to remain in place after construction.

D. Repair or replace any damaged new or existing construction or materials resulting from placement or removal of bracing and shoring, or as a result of such operations on the project site.

3.5 REMOVAL OF MATERIALS

A. In addition to what is specifically shown on the Drawings, remove items as necessary to provide access or to allow alterations and new work to proceed. Including such items as:
   1. Removal of abandoned items and items serving no useful purpose, such as framing, blocking, abandoned piping, conduit, ductwork, wiring, switches, junction boxes, fittings, anchors, fasteners and appurtenances associated with the removed or abandoned items or construction for a make ready condition for new construction or patching.
   2. Removal of unsuitable or extraneous materials not marked for salvage.
   3. Cleaning of surfaces and removal of surface finishes as needed to install new work and finishes.

B. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition work above each floor or tier before disturbing supporting members on lower levels.

C. Cutting and Drilling:
   1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. To minimize disturbance of adjacent surfaces, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
   2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame cutting operations. Maintain portable fire suppression devices during flame cutting operations.
   4. Maintain adequate ventilation when using cutting torches.

D. Remove decayed, vermin infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

E. Equipment and Material Loading Requirements: Locate selective demolition equipment throughout the structure and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing. Verify existing load capacity before the start of demolition work.

F. Demolish non-loading bearing concrete and masonry walls, floor areas, and other construction in reasonably small sections, using bracing and shoring as necessary to prevent walls, roof, floors, and adjacent construction from collapsing. Cut concrete and masonry at junctures with construction to remain, using power driven masonry saw or hand tools; do not use power driven impact tools.
   1. Do not free fall materials, walls, or other construction during selective demolition.

G. Slabs On Grade: Break up and remove off-site concrete slabs on grade, unless otherwise shown to remain.

H. Handle structural steel members individually. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

I. Remove resilient floor coverings and adhesive according to recommendations of the Resilient Floor Covering Institute's (RFCI), Recommended Work Practices for the Removal of Resilient Floor Coverings and Addendum.
   1. Remove residual adhesive and prepare substrate for new floor coverings by one of the methods recommended by RFCI.

J. Remove air-conditioning equipment without releasing refrigerants.

K. Wet down piled materials and materials being discharged into vehicles. Do not flood areas or materials, or allow water to accumulate on the site.

L. Remove materials resulting from the selective demolition work from the site in such a manner as to avoid creating a nuisance as required by building management. Dispose of materials from the site in a legal manner on a daily basis. Coordinate routes of removed materials through the building or buildings with the Owner's representative.
   1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.

M. Leave each area of the building broom clean upon completion of the demolition work.

N. Removed and Salvaged Items: Comply with the following:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.

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

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

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
1. Completely fill holes and depressions in existing masonry walls that are to remain with a compatible masonry patching material as approved by the Architect, applied according to manufacturer's written recommendations.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

D. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the existing and new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other specification sections.
2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

E. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.7 POLLUTION CONTROLS

A. Do not use water inside the building to control dust. Use temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.

B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

3.8 CLEANING

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

B. Clean building interior areas of dust, dirt, and debris caused by selective demolition, leave areas broom clean.

C. Remove containers, equipment, temporary construction, and protection used for selective demolition.

END OF SECTION

1. CONFORMED TO TEMPLATE (MAR 2020).

SECTION 03 20 00
SITE CONCRETE REINFORCEMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Work includes providing complete, in-place, all steel and fibers required for reinforcement of cast-in-place concrete as shown on the drawings.

B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.2 REFERENCES

A. Applicable standards listed in this section include, but are not necessarily limited to the following:
   1. ACI 315–Manual of Standard Practice for Detailing Reinforced Concrete Structures.
   2. ACI 318–Building Code Requirements for Reinforced Concrete.
   3. ASTM A1064–Standard Specifications for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
   4. ASTM A615–Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   5. ASTM A996–Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcing.
   6. ASTM C1116-Standard Specification for Fiber-Reinforced Concrete.
   7. CRSI–Manual of Standard Practice.

1.3 SUBMITTALS

A. Comply with pertinent provisions of Section 01 33 00–Submittals.

B. Provide complete shop drawings of all material to be furnished and installed under this section:
   1. Before fabrication of the reinforcement is begun, CONTRACTOR shall obtain the approval of ENGINEER on reinforcing bar lists and placing drawings.
   2. These drawings and lists shall show in detail the number, size, length, bending, and arrangement of the reinforcing. Reinforcing supports shall also be located on the shop drawings.
   3. Shop drawings shall be in accordance with ACI 315.

1.4 PRODUCT HANDLING

A. Delivery:
   1. Deliver reinforcement to the job site bundled, tagged, and marked.

2. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

B. Storage: Store reinforcement at the job site on blocks and in a manner to prevent damage and accumulation of dirt and excessive rust.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Reinforcing bars shall comply with ASTM A615 or A996 Type R, Grade 60. Reinforcing bars required to be welded shall be ASTM A706 low alloy.

B. Steel wire and welded wire fabric shall comply with ASTM A1064. Fabric shall be provided in flat sheets. Rolled fabric shall not be used. Welded wire fabric to be used shall be WWR 6x6 WI.4 X WI.4.

C. Reinforcement supports including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcement in place shall be:
1. Wire bar-type supports complying with CRSI recommendations, unless otherwise indicated.
2. For slabs on grade, supports with sand plates, or horizontal runners where base material will not support chair legs.
3. For exposed-to-view concrete surfaces or where the concrete surface will be exposed to weather or moisture, where legs of supports are in contact with forms, supports with either hot-dipped galvanized or plastic protected legs.
4. When supports bear directly on the ground and it is not practical to use steel bar supports, precast concrete blocks may be used to support only the bottom lift of reinforcement. The precast blocks must be solid, be of an equal or higher strength than the concrete being placed, must provide adequate support to the reinforcement, and be of proper height to provide specified reinforcing cover. The use of face bricks, hollow concrete blocks, rocks, wood blocks, or other unapproved objects will not be permitted.

D. Fibrous Reinforcing:
1. Fibrous concrete reinforcement shall be Fibermesh 300, manufactured by Propex Concrete Systems, or equal.
2. Reinforcement shall be 100% virgin polypropylene fibrillated, multi-length graded fiber containing no reprocessed olefin materials and specifically manufactured for use as concrete secondary reinforcement.
3. Physical Characteristics:
   a. Specific Gravity: 0.91.
   b. Fiber Length: Multidesign gradation.

E. Mechanical Splices and Threaded Couplers:
1. Mechanical splices shall be Zap Screwlok by Bar Splice Products, Inc., or equal.
2. Threaded couplers and dowel bar replacements shall be Dowel Bar Splicer System by Dayton/Richmond, or equal.

3. Mechanical splices and couplers shall be capable of developing at least 125% of the yield strength of the reinforcing bar.

2.2 FABRICATION

A. General:
1. Fabricate reinforcing bars to conform to required shapes and dimensions with fabrication tolerances which comply with CRSI Manual.
2. In case of fabricating errors, do not rebend or straighten reinforcement in a manner that will injure or weaken the material.
3. Unless otherwise shown on the drawings, all end hook dimensions shall conform with ACI Standard Hooks.

B. Reinforcement with any of the following defects shall be deemed unacceptable and will not be permitted in the work:
1. Bar lengths, depths, and bends exceeding specified fabrication tolerances.
2. Bend or kinks not indicated on drawings or final shop drawings.
3. Bar with reduced cross section because of excessive rusting or other cause.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine the substrate, formwork, and the conditions under which concrete reinforcement is to be placed.

B. Correct conditions detrimental to the proper and timely completion of the work.

C. Do not proceed until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:
1. Comply with the specified standards for details and methods of placing reinforcement and supports.
2. Clean reinforcement to remove loose rust, mill scale, earth, and other materials which reduce or destroy bond with concrete.

B. Placing Reinforcement:
1. All reinforcing shall be placed in accordance with Contract drawings and with shop drawings stamped and approved by ENGINEER.
2. Position, support, and secure reinforcing against displacement by formwork, construction, or concrete placement operations.
3. Support reinforcing by metal chairs, runners, bolsters, spacers, and hangers as needed.
4. Unless otherwise shown on the drawings, the reinforcement is to be so detailed and placed as to allow the following concrete protection:

a. Three inches of cover where the concrete is placed directly against ground.
b. Two inches of cover where the concrete is placed in forms but is to be exposed to weather, liquid, or the ground.

5. Reinforcement shall be positioned within ±3/8-inch for members with depth to tension reinforcing from compression face less than or equal to 8 inches. Tolerance shall be±1/2 inch for members with depth to tension reinforcing from compression face greater than 8 inches. Tolerance on dimension between adjacent bars in slab and wall reinforcing mats shall be 1 inch. Secure against displacement by anchoring at the supports and bar intersections with wire or clips.
6. Bars shall be securely tied at all intersections except where spacing is less than 1 foot in each direction when alternate intersections shall be tied. To avoid interference with embedded items, bar spacing may be varied slightly if acceptable to ENGINEER. Tack welding of reinforcing will not be permitted.
7. Set wire ties so that twisted ends are directed away from exposed concrete surfaces.
8. If reinforcing must be cut because of openings or embedded items in the concrete, additional reinforcing must be provided adjacent to the opening at least equal in cross sectional area to that reinforcing which was cut, and it shall extend a minimum of 36 bars diameters beyond the opening on each side or as shown on the drawings. At sumps or depressions in slabs, bars shall be bent and/or extended under sumps or depressions.
9. If carrier bars are to be used, CONTRACTOR shall provide reinforcing bars for this purpose in addition to the reinforcing called for by the drawings and specifications.

C. Reinforcement Supports:
1. Strength and number of supports shall be sufficient to carry reinforcement.
2. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support.
3. Do not use supports as bases for runways for concrete-conveying equipment and similar construction loads.

D. Welded Wire Fabric:
1. Install welded wire fabric in as long of lengths as practicable.
2. Lap adjoining pieces at least one full mesh.
3. Fabric shall be supported with bar supports.

E. Embedded Items:
1. Allow other trades to install embedded items as necessary.
2. Particularly after bottom layer of reinforcing is placed in slabs, allow electrical contractors to install conduit scheduled for encasement in slabs prior to placing upper layer of reinforcing.

F. Fibrous Reinforcing:
1. Add fibers at a minimum rate of 1.5 pounds per cubic yard.
2. Mix concrete in strict accordance with reinforcement manufacturer’s recommendations.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Work Included:
   1. All cast-in-place concrete as shown except as noted otherwise.
   2. PVC and hydrophilic waterstops, expansion joint fillers, bonding agents, patching mortars, curing compounds, nonshrink grout, grout topping, floor sealer, and other related items and accessories.

B. Related Sections and Divisions: Applicable provisions of Division 01 shall govern work in this section.

1.2 REFERENCES

A. ACI 211.1–Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete.

B. ACI 301–Specifications for Structural Concrete.

C. ACI 304R–Guide for Measuring, Mixing, Transporting, and Placing Concrete.

D. ACI 305R–Guide to Hot Weather Concreting.

E. ACI 306R–Guide to Cold Weather Concreting.

F. ACI 308–Specification for Curing Concrete.

G. ACI 309–Guide for Consolidation of Concrete.

H. ACI 318–Building Code Requirements for Structural Concrete and Commentary.

I. ASTM C31–Standard Practice for Making and Curing Concrete Test Specimens in the Field.

J. ASTM C33–Standard Specification for Concrete Aggregates.

K. ASTM C39–Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.

L. ASTM C40–Standard Test Method for Organic Impurities in Fine Aggregates for Concrete.

M. ASTM C88-Standard Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate.

N. ASTM C94–Standard Specification for Ready-Mixed Concrete.

O. ASTM C143–Standard Test Method for Slump of Hydraulic-Cement Concrete.

P. ASTM C150–Standard Specification for Portland Cement.

Q. ASTM C156–Standard Test Method for Water Loss (from a Mortar Specimen) Through Liquid Membrane-Forming Curing Compounds for Concrete.

R. ASTM C172–Standard Practice for Sampling Freshly Mixed Concrete.

S. ASTM C231–Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.

T. ASTM C260–Standard Specification for Air-Entraining Admixtures for Concrete.

U. ASTM C309–Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

V. ASTM C494–Standard Specification for Chemical Admixtures for Concrete.

W. ASTM C618–Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

X. ASTM C652–Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).

Y. ASTM D994–Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).

Z. ASTM D1752–Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.3 SUBMITTALS

A. Submit shop drawings in accordance with Section 01 33 00–Submittals.

B. Submit the following information:
1. Gradation of fine and coarse aggregate–ASTM C33.
2. Specific gravity and dry rodded density of each aggregate.
3. Test of deleterious substances in fine and coarse aggregate–ASTM C33.
4. Design mix of each individual concrete mix to be used.
5. Previous test results or trial batch results with 7- and 28-day compressive strengths for each concrete mix proposed.
6. Certified mill test results for cement identifying brand, type, and chemistry of cement to be used.
7. Brand, type, principal ingredient, and amount of each admixture to be used.

C. It is important that the above data be submitted to ENGINEER well in advance of anticipated concreting operations to avoid any delay in construction.

PART 2 - PRODUCTS

2.1 CEMENT

A. Cement shall be Portland cement conforming to ASTM C150. Cement used for structures exposed to wastewater, sludge, combined sewage, or sanitary sewage shall be Type II or Type I/II. All other cement shall be Type I or Type I/II. Type III cement shall be used only when permitted by ENGINEER. All cement shall be the product of one reputable manufacturer and mill.

B. Cement shall be stored in a dry, weathertight, properly ventilated structure with the floor raised not less than 1 foot above the ground.

2.2 FLY ASH

A. All fly ash used as an admixture in Portland cement concrete shall be Class C or F conforming to the requirements of ASTM C618.

2.3 AGGREGATE

A. All aggregates shall be washed and shall consist of natural sand, gravel, or crushed rock and shall have clean, hard, durable, uncoated grains of strong minerals. The amounts of deleterious substances present in the fine and coarse aggregate expressed in percentages by weight shall not exceed the following:

	Aggregate	
Deleterious Substance	Fine	Coarse
Clay Lumps and Friable Particles	3.0	3.0
Coal and Lignite	0.5	0.5
Mineral finer than No. 200 sieve	3.0	
Soft Fragments	3.0	3.0
Chert*	---	5.0
Sum of Chert and Clay Lumps		5.0

*Material classified as chert and having a bulk specific gravity of less than 2.45. The percentage of chert shall be determined on the basis of the weight of chert in the sample retained on a 3/8-inch sieve divided by the weight of the total sample.

B. The combined amount of all deleterious substances in an aggregate shall not exceed 5% of the weight of the aggregate.

C. If required by ENGINEER, sodium sulfate soundness tests (ASTM C88) shall be performed on the aggregate. When the aggregate is subjected to 5 cycles, the weight loss shall not exceed 12%. Samples of proposed aggregates shall be submitted to an independent laboratory for testing in advance of concrete work. All testing shall be performed in accordance with ASTM C33. Certified test results shall be submitted to ENGINEER confirming that aggregate complies with all stated specifications. Report shall identify source of aggregate and absorbed water.

D. Fine aggregate shall be well-graded from coarse to fine and shall conform to the following requirements:

Percentage by Weight	
Passing 3/8-inch sieve	100
Passing No. 4 sieve	95-100
Passing No. 8 sieve	80-100
Passing No. 16 sieve	50-85
Passing No. 30 sieve	25-60
Passing No. 50 sieve	5-30
Passing No. 100 sieve	0-10

E. Gradation of fine aggregate shall be reasonably uniform and not subject to the extreme percentages of gradation specified above. The fineness modulus shall be not less than 2.3 or more than 3.1, nor shall the fineness modulus of any sample vary by more than +0.20 from the fineness modulus of the representative sample used in proportioning the concrete.

F. If required by ENGINEER, fine aggregate shall be subjected to the color-metric test for organic impurities (ASTM C40) and shall not produce a color darker than Figure 1, unless they pass the mortar strength test. Aggregate producing color darker than Figure 2 shall not be used in any event.

G. Coarse aggregate shall be well-graded from coarse to fine, and when tested by laboratory sieves having square openings, shall conform to the following requirements:

	Percentage by Weight Aggre-gate	
	3/4-inch Stone	1 1/2-inch Stone
Passing 2-inch sieve	---	100
Passing 1 1/2-inch sieve	---	90-100
Passing 1-inch sieve	100	20-55
Passing 3/4-inch sieve	90-100	0-15
Passing 3/8-inch sieve	20-55	0-5
Passing No. 4 sieve	0-10	---
Passing No. 8 sieve	0-5	---

H. The 3/4-inch aggregate shall be used in concrete members no thinner than 4 inches and less than 10 inches thick. A blend of 3/4-inch and 1 1/2-inch aggregate shall be used in members 10 inches thick and thicker with the 3/4-inch aggregate

comprising between 35% and 65% of the total course aggregate. When members thinner than 10 inches are placed monolithically with members thicker than 10 inches, the aggregate requirements for the thinner member shall apply.

I. Aggregates must be allowed to drain for at least 12 hours before being used. The ground upon which aggregates are stored must be hard, firm, well-drained, and free from all vegetable matter. Various sizes of aggregates must be stored separately, and if they have become contaminated or merged with each other, they shall not be used.

2.4 WATER

A. Water used in mixing concrete shall be clean and free from injurious amounts of oil, alkali, organic matter, or other deleterious substances.

2.5 ADMIXTURES

A. Water Reducing Admixture shall be Master Pozzolith® 200 by Master Builders Solutions, Daracem 19 by Grace, or equal. Water reducing admixture shall conform to ASTM C494, Type A and Type F. Water reducing admixture shall not reduce durability, shall increase strength 10%, and shall not affect bleeding characteristics over reference mix.

B. Air-Entraining Admixture shall be equal to MasterAir® AE 90 by Master Builders Solutions, Darex by Grace Construction Products, or equal. Air-entraining admixture shall conform to ASTM C260.

C. No other admixture will be allowed without written approval of ENGINEER. All admixture shall be compatible with cement, aggregate, and water used.

2.6 PROPORTIONING

A. The proportions of aggregate to cement shall be such as to produce a workable mixture that can be thoroughly compacted and that will work readily in the forms and around reinforcement without permitting materials to segregate or excess water to collect on the surfaces. The combined aggregates shall be such that when separated on the No. 4 sieve, the weight passing the sieve shall not be less than 30% nor greater than 50%.

B. Concrete of various classes shall have the following maximum water/cement or water/(cement + fly ash) ratio minimum compressive strengths at 28 days and minimum cement and fly ash contents:

Class	Maximum Water/ Cement or Water/ (Cement+Fly Ash)	Minimum 28 Day Strength-Pounds per Square Inch	Cement Con-tent-Pounds per Cubic Yard	Fly Ash-Pounds per Cubic Yard	
				Type C	Type F
AA	0.42	4,500	611	---	---
A	0.45	4,000	564	---	---
A-FA	0.45	4,000	480	110	125
B	0.53	3,500	517	---	---
C	0.53	3,000	517	---	---
X	---	2,000	376	---	---

C. Except as otherwise indicated on the drawings or specified, all concrete shall be Class A.

D. All concrete mixes shall be designed for a strength of 15% above that specified to allow for job variations. All mixes shall be designed in accordance with ACI 211.1 by a competent concrete engineer or competent laboratory technician. Required materials test data shall be submitted with design mixes for review and approval by ENGINEER. Mix computations shall be submitted if requested by ENGINEER.

E. The slump for all concrete shall be 3 inches and concrete with a slump within the range of 2 to 3 1/2 inches will be acceptable unless otherwise stated.

F. A water-reducing admixture shall be used in all concrete. A qualified representative of the manufacturer shall be available to assist in proportioning the concrete, advise on the proper addition of the admixture to the concrete, and advise on adjustments of concrete proportions to suit job conditions.

G. An air-entraining admixture shall be used in all concrete except as noted. Air content shall be tested by the pressure method as outlined in ASTM C231 and shall be between 4% to 7% by volume. An air-entraining admixture is not required for concrete patching and for concrete floors, equipment pads, and supports in interior heated buildings where the concrete will be protected from freezing during and after construction.

H. CONTRACTOR shall submit to ENGINEER concrete cylinder compressive strength results from previous projects for the same concrete mixes proposed on the current project. If this information is not available, one cubic yard trial batches of each individual mix proposed for use shall be made prior to use in the work. Four test cylinders shall be made for each trial batch, two to be tested at 7 days and two at 28 days. The trial batches shall be made preceding actual placement operations so that the results of the 7-day tests can be obtained. All costs for material, equipment, and labor incurred during design of concrete mixes shall be borne by CONTRACTOR.

I. All aggregates shall be measured by weight. The concrete mixer is to be equipped with an automatic water-measuring device that can be adjusted to deliver the desired amount of water.

2.7 JOINT FILLER

A. Expansion joints shall have standard 1/2 inch thick cork expansion joint filler, W. R. Meadows, or equal, meeting ASTM D1752–Type II. Exceptions to this are expansion joints in exterior concrete walks and between concrete walks and other structures which shall be asphalt expansion joint filler, 1/2 inch thick, Grace, W.R. Meadows, or equal, meeting ASTM D994.

2.8 BONDING AGENT

A. Acceptable manufacturers include MasterProtect® P 110 by Master Builders Solutions, MasterEmaco® P 124 by Master Builders Solutions, MasterEmaco® ADH 326 by Master Builders Solutions, or equal.

2.9 PATCHING ADDITIVE

A. Acceptable manufacturers include MasterEmaco® A 660 by Master Builders Solutions, Sonocrete by Sonneborn Contech Co., or equal.

2.10 NONSHRINK GROUT

A. Acceptable manufacturers include Dayton Superior, Master Builders Solutions, or equal. Grout shall be nonshrink, nonmetallic and shall achieve a strength of 7,500 psi in 28 days.

2.11 CURE–SEAL HARDENER

A. Penetrating sealer for interior building floors shall be Ashford Formula by Curecrete Chemical Company, Inc., or equal. See finish schedule for locations to be used.

PART 3 - EXECUTION

3.1 MIXING

A. Ready-mixed concrete shall be batched, mixed, and delivered in accordance with ASTM C94 and ACI 304R. In general, concrete shall be mixed 50 revolutions at plant, 20 upon arrival at site, and 20 each time water is added; maximum of 110 revolutions at mixing speed. Concrete shall be delivered and discharged within 1 1/2 hours or before the drum has revolved 300 times after introduction of water to the cement and aggregates or the cement to the aggregates. Truck mixers shall be equipped with drum revolution counters. In no event shall concrete which has

taken its initial set be allowed to be used. Retempering of concrete is not permitted.

B. A representative of ENGINEER may be at the batching plant periodically to observe the batching and mixing.

C. No water shall be added on the job unless required by CONTRACTOR and with the knowledge of ENGINEER; the amount of water, if added, shall be recorded on all copies of the delivery tickets. If water is added, CONTRACTOR shall verify that the required water-cement ratio is not exceeded.

D. Concrete shall have a temperature not less than 60°F nor more than 80°F as delivered to the jobsite.

E. With each load of concrete, CONTRACTOR shall obtain delivery tickets and shall make these tickets available for review by ENGINEER. Delivery tickets shall provide the following information:
1. Date.
2. Name of ready-mix concrete plant, job location, and CONTRACTOR.
3. Type of cement and admixtures, if any.
4. Specified cement content in sacks per cubic yard of concrete and approved concrete mix number or designation.
5. Amount of concrete in load, in cubic yards.
6. Water-cement ratio.
7. Water added at job, if any.
8. Truck number and time dispatched.
9. Number of mixing drum revolutions.

F. For job-mixed concrete, all concrete materials shall be mixed in a machine batch mixer for at least 1 1/2 minutes after all ingredients are in the mixer and shall continue until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall not be loaded beyond the capacity given by the manufacturer and shall be rotated at the speed recommended by the manufacturer. The mixer is to be provided with positive timing device that will positively prevent discharging the mixture until the specified mixing time has elapsed.

3.2 JOINTS

A. CONTRACTOR shall place all joints as shown on the drawings or specified herein. If approved by ENGINEER, CONTRACTOR may, at his own expense, place construction joints in addition to and at places other than those shown on the drawings. Unless otherwise shown, all joints shall be straight, truly vertical or horizontal, and proper methods shall be employed to obtain this result.

B. Where construction joints are not shown on the drawings or specified elsewhere, CONTRACTOR shall provide construction joints in walls as follows:
1. Vertical construction joints at 60 feet on center maximum but not more than 15 feet from corners or intersections.
2. Horizontal construction joints at 18 feet on center maximum for walls 12 inches or more in thickness.

3. Horizontal construction joints of 8 feet on center maximum for walls 10 inches or less in thickness.

C. Immediately after completion of the first pour at a joint, the concrete surface, reinforcement, and waterstop projecting beyond the joint shall be thoroughly cleaned and laitance removed. The waterstops shall not be disturbed after the concrete in the first pour at a joint has set. Concrete around waterstops shall be thoroughly compacted by hand spading and vibrating. Immediately before the second pour, all extraneous matter shall be removed from the joint, the waterstop and steel cleaned, and the surface thoroughly wetted.

D. Concrete at all joints shall have been in place at least 48 hours before abutting concrete is placed. At least two hours must elapse after depositing concrete in columns or walls before depositing in beams, girders, or slab supported thereon. Beams, girders, brackets, column capital, and haunches shall be considered as part of the floor system and shall be placed integrally therewith.

3.3 BONDING TO EXISTING CONCRETE

A. When placing new concrete adjacent to existing concrete, the existing concrete shall be thoroughly roughened, cleaned, and saturated with water 24 hours before pouring new concrete. Existing concrete is defined as concrete more than six months old. At time of new pour, remove any standing water and apply bonding agent. Bonding agent shall be applied in accordance with manufacturer’s recommendations.

3.4 PATCHING EXISTING CONCRETE

A. When patching existing concrete, remove poor concrete until firm hard concrete is exposed; roughen and clean surface of the existing concrete, clean any exposed reinforcing bars, and pour new concrete. Concrete finish shall match existing concrete. New concrete shall be 4,000 psi 28-day strength mixed with patching additive, mixed according to manufacturer’s instructions. Concrete shall not be air-entrained.

3.5 EMBEDDED ITEMS IN CONCRETE

A. All sleeves, inserts, anchors, and embedded items required for adjoining work or for its support shall be placed prior to concreting.

B. All contractors whose work is related to the concrete or must be supported by it shall be given ample notice and opportunity to introduce and/or furnish embedded items before the concrete is placed.

C. Embedded items shall be positioned accurately and supported against displacement. Reinforcing bars shall clear embedded items a minimum of 2 inches.

3.6 PLACING CONCRETE

A. Before placing concrete, all equipment, forms, ground, reinforcements, and other surfaces with which the concrete will come in contact are to be thoroughly cleaned of all debris, ice, and water. Ground shall be wetted prior to placement of concrete on it.

B. After reinforcement is placed and before concrete is placed over it, ENGINEER shall be allowed sufficient time to observe the reinforcing.

C. Unless otherwise authorized by ENGINEER, all concrete shall be placed in the presence of ENGINEER.

D. Concrete shall be conveyed from the mixer to the place of final deposit as rapidly as practicable by methods that will prevent the segregation or loss of materials. Chuting for conveying purposes must be accomplished in such a manner as to prevent segregation or loss of materials. Receiving hoppers shall be installed at the chute discharge and at no point in its travel from the mixer to place of final deposit shall the concrete pass through a free vertical drop of more than 3 feet. Elephant trunks or tremies shall be used in all wall pours to prevent coating of forms and reinforcing bars.

E. Care shall be taken to avoid an excess of water on the concrete surface. Excess water shall be drained or otherwise removed from the surface. Dry cement or a mixture of cement and sand shall not be sprinkled directly on the surface to absorb water.

F. Concrete in wall and beam pours shall be deposited in approximately horizontal layers not to exceed 18 inches in thickness. Each layer shall be well worked into the preceding layer while both layers are still soft.

G. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation from rehandling or flowing. The maximum allowable lateral movement of the concrete after being deposited is 3 feet. Once concreting is started, it shall be carried on as a continuous operation until the placing of the section or panel is completed.

H. All concrete shall be placed with the aid of mechanical vibrating equipment in accordance with ACI 309. In congested areas, vibration shall be supplemented by hand spading adjacent to the forms. Vibration should secure the desired results within 5 to 15 seconds at intervals of 18 inches apart maximum. The vibrator shall penetrate the preceding layer of concrete. Vibrators shall have a frequency of not less than 10,000 impulses per minute when in operation submerged in concrete.

I. A sufficient number of spare vibrators shall be kept in ready reserve to provide adequate vibration in case of breakdown of those in use.

J. In placing concrete in beams where it is intended to be continuous and monolithic with the slab above, a delay to provide for settlement of the deep concrete shall be scheduled before placing the upper concrete in the slab. The length of delay shall be as long as possible and still permit the revibration of the deep concrete.

K. Concrete is not to be placed under water. A suitable means shall be provided for lowering the water level below surfaces upon which concrete is to be placed. This may require excavating approximately 12 inches below the bottom of the concrete surface and refilling with gravel and compacting. The groundwater shall not be allowed to rise to the bottom of the concrete until 24 hours after the concrete pour has been completed. Water shall not be allowed to fall upon or run across the concrete during this period.

L. No extra payment will be allowed for dewatering, undercutting, and gravel fill.

3.7 MOIST CURING

A. All concrete shall be maintained in a moist condition for at least 7 days after being deposited except that for high-early strength concrete, a 3-day period will be sufficient. Moist curing shall be accomplished by one of the following methods:
   1. Wood forms left in place and kept wet at all times. If wood forms are not going to be kept wet or if metal forms are used, they shall be removed as soon as practicable and other methods of moist curing shall be started without delay.
   2. Use of a curing compound conforming to ASTM C309, Type I as approved by ENGINEER. Curing compound shall be applied at a uniform rate as indicated by the manufacturer sufficient to comply with the requirements of the test water retention of ASTM C156. Curing compound applied to vertical concrete surfaces after forms are removed shall be specially adapted to provide required coverage on the vertical surface. On nonformed surfaces, the curing compound shall be applied immediately after the disappearance of the water sheen after finishing of the concrete. Curing compound shall not be used on concrete surfaces that are to be painted, receive ceramic tile or resilient flooring, or be waterproofed. Care shall be taken not to get curing compound on construction joints, reinforcing steel, and other surfaces against which new concrete will be poured.
   3. Use of plastic film. Plastic film shall have a minimum thickness of 4 mils. It shall be placed over the wet surface of the fresh concrete as soon as possible without marring the surface and shall be weighted so that it remains in contact with all exposed surfaces of the concrete. All joints and edges shall be lapped and weighted. Any tears in the film shall be immediately repaired.
   4. Application of wet coverings weighing 9 ounces per square yard such as burlap, cotton mats, or other moisture-retaining fabrics. The covering system shall include two layers and shall be kept continuously moist so that a film of water remains on the concrete surface throughout the curing period.
   5. Use of an approved waterproof curing paper. Edges of adjacent sheets shall be overlapped several inches and tightly sealed.
   6. Ponding of water or continuous sprinkling of water is permitted. Sprinkling at intervals will not be permitted.
   7. Construction joints shall be moist cured by one of the methods listed above except by Method "2."

B. The use of moist earth, sand, hay, or another method that may discolor hardened concrete will not be permitted.

3.8 HOT WEATHER CONCRETING

A. When the atmospheric temperature exceeds 80°F during concrete placement, this section and ACI 305 shall apply in addition to all other sections of the specifications.

B. The temperature of the delivered concrete shall not exceed 85°F.

C. Care shall be exercised to keep mixing time and elapsed time between mixing and placement at a minimum. Ready-mix trucks shall be dispatched so as to avoid delay in concrete placement, and the work shall be organized to use the concrete promptly after arrival at the jobsite.

D. The subgrade, forms, and reinforcing shall be sprinkled with cool water just prior to placement of concrete. Prior to placing concrete, there shall be no standing water or puddles on the subgrade.

E. If approved by ENGINEER, an admixture for retarding the setting of the concrete may be used.

F. Exposed concrete surfaces shall be carefully protected from drying. Continuous water curing is preferred. Curing compounds shall be white pigmented.

3.9 COLD WEATHER CONCRETING

A. Conditions of this section shall apply, in addition to all other sections of the specifications, when placing concrete in cold weather. Cold weather is defined as a period when, for more than 3 successive days, the average daily temperature drops below 40°F. When temperatures above 50°F occur during more than half of any 24-hour period, the period will no longer be regarded as cold weather. The average daily temperature is the average of the highest and lowest temperature during the period from midnight to midnight. Cold weather concreting shall conform to all requirements of ACI 306.1, except as modified by the requirements of these specifications.

B. Detailed procedures for the production, placement, protection, curing, and temperature monitoring of concrete during cold weather shall be submitted to ENGINEER. Cold weather concreting shall not begin until these procedures have been reviewed for conformance with ACI 306.1.

C. All concrete materials, forms, ground, mixing equipment, and other surfaces with which the concrete is to come in contact shall be free from frost, and the temperature of contact surfaces shall be 35°F or above. Ground upon which concrete is to be placed shall not be frozen at any depth.

D. The mixing water and aggregates shall be heated and when entering the mixer shall have temperatures not exceeding 175°F and 80°F, respectively. Concrete temperature as mixed shall not exceed 80°F and shall typically be between 55°F and 70°F. Concrete, when placed in the forms, shall have a temperature of not less than 50°F.

E. Freshly placed concrete shall be protected by adequate covering, insulating, or housing and heating. If heating is used, ambient temperature inside the housing shall be maintained at a minimum of 70°F for 3 days or 50°F for 5 days. The maximum ambient temperature during curing shall not exceed 80°F. If insulating methods are used, recommendations contained in ACI 306R shall be followed. Surface temperature shall be maintained at 50°F for 7 days. After the curing period, the temperature of the concrete shall be reduced uniformly at a rate not to exceed 40°F per 24 hours until outside air temperature is reached. Heating of enclosure shall continue if it is anticipated that the outside air temperature will drop more than 20°F in the next 24 hours. The concrete temperature shall be obtained by attaching a thermometer provided by CONTRACTOR to the concrete surface. Concrete shall be kept moist.

F. If heating is used, the housing shall be constructed weathertight and shall be constructed in a manner that will provide uniform air circulation and air temperatures over the complete concrete area that is being cured. Special attention shall be given to the edges and ends of a concrete pour with the housing extending at least 5 feet beyond any concrete surface being protected. The housing shall be in place and heat applied within 2 hours after concrete placement.

G. Heating may be by steam or hot air. Heaters shall be vented to outside of the housing. Open burning salamanders will not be permitted. Heating devices shall not be placed so close to the concrete as to cause rapid drying or discoloration from smoke.

H. If heating is used, CONTRACTOR shall provide sufficient 24-hour inspection of the heaters to provide compliance with the above-specified temperature requirements during the curing period. CONTRACTOR shall provide maximum-minimum thermometers for ENGINEER’s use.

I. The use of calcium chloride, salts, or other chemical admixtures for the prevention of freezing is prohibited.

J. Salts or other deleterious materials shall not be used on temporary or permanent structures above concrete surfaces that are being placed, finished, or cured.

3.10 FINISHING

A. Flat Work:
   1. Floated Finish: Place, consolidate, strike off, and level concrete eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared and the surface has stiffened sufficiently to permit the operation. Immediately refloat the slab to a uniform texture.
   2. Light Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks.
   3. Hard Troweled Finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled.

4. Tolerance for concrete floors shall be 1/4 inch within 10 feet in any direction. Straight edge shall be furnished by CONTRACTOR.
5. Broom or Belt Finish: Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a broom or burlap belt across the surface.
6. The above finishes shall be used in the following locations:
    a. Float Finish: Surface to receive roofing, waterproofing, or sand bed terrazzo.
    b. Light Troweled Finish: Submerged tank slabs.
    c. Hard Troweled Finish: Building floors.
    d. Broom or Belt Finish: Exterior slabs, sidewalks, tops of walls, and tank slabs to receive grout topping.

B. Formed Surfaces:
1. Within 2 days after removing forms and prior to application of a curing compound, all concrete surfaces shall be observed and any poor joints, voids, stone pockets, or other defective areas shall be patched at once before the concrete is thoroughly dry. Defective areas shall be chipped away to remove all loose and partially bonded aggregate. The area shall be thoroughly wetted and filled with as dry as practical mortar mix placed to slightly overfill the recess. Mortar shall include a bonding agent. After partial set has taken place, the excess mortar shall be removed flush with the surface on the concrete using a wood float. All patching shall be cured, protected, and covered as specified for concrete. All cracks, leaks, or moist spots that appear shall be repaired. No extra compensation will be allowed CONTRACTOR for such work.
2. The exterior or removal portion of nonremovable ties shall be removed with the use of a special tool designed for this purpose. Cutting or chipping of concrete to permit removal of exterior portion will not be permitted.
3. For nonremovable ties, tie rod holes left by the removal of the exterior portion of the tie and cone shall be thoroughly wetted and filled by ramming with as dry as practical mortar mix in such a manner such that it completely fills the hole. Mortar shall include a bonding agent. All patching shall be cured, protected, and covered as specified for concrete. The holes are to be filled immediately after removal of the exterior portion of the tie.
4. Holes left by removable ties shall be filled by installing a neoprene plug near the center of the wall. The balance of the hole shall be filled with mortar as specified above to within 1 inch of the face of the wall. The remainder of the hole shall be filled with a waterproofing compound.
5. All finished or formed surfaces shall conform accurately to the shape, alignment, grades, and sections as shown or prescribed by ENGINEER. All surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness. All sharp angles, where required, shall be rounded or beveled. Any formed surface to be painted shall be free of any material that will be detrimental to the paint. The surface of the concrete shall be given one of the following finishes immediately after form stripping:
    a. Finish A shall be referred to as a sack finish. Surfaces shall be free of contaminants prior to sacking. After wetting the surface, a grout shall be rubbed in using a rubber float or burlap. After the grout hardens sufficiently, it shall be scraped from the surface with the edge of a steel trowel without disturbing the grout in the air holes. After further drying, the surface shall be rubbed with burlap to remove all surface grout. The entire surface shall be finished to secure a continuous, hard, dust free

uniform texture surface free from pinholes and other minor imperfections. Finish A will be required for all unpainted surfaces (See Section 09 91 00 for painted surfaces), interior surfaces of equipment rooms, operation areas, and permanently exposed vertical surfaces. Where steel faced forms are used to form walls, the portion of wall to receive the sack finish shall first be roughened by brush blasting or other acceptable method to achieve a texture similar to 40 to 60 grit sandpaper.

b. Finish B shall be the same as Finish A, except that the final burlap rubbing may be omitted, providing the steel trowel scraping removes the loose buildup from the surface. Finish B shall be provided for waterproof and moistureproof coated surfaces.

c. Finish C shall be referred to as a finish that has surface imperfections less than 3/8 inches in any dimension. Surface imperfections greater than 3/8 inches shall be repaired or removed and the affected areas neatly patched. Finish C or smoother shall be provided for interior surfaces of wet wells, tanks, and channels from 1 foot below minimum water surfaces and down and otherwise unfinished interior surfaces.

d. Finish D shall be the finish for surfaces that may be left as they come from the forms, except that tie holes shall be plugged and defects greater than 1/2 inch in any dimension shall be repaired. Finish D shall be provided for surfaces to be buried or covered by other construction such as masonry veneer.

C. All precautions shall be taken to protect the concrete from stains or abrasions, and any such damage shall be removed or repaired under this Contract.

3.11 LOADING OF CONCRETE STRUCTURES

A. No concrete structure or portion thereof shall be loaded with its design load until the concrete has obtained its specified 28 day compressive strength. This shall include but not be limited to vertical live load, equipment loading, water loading, groundwater loading, and backfill load. Concrete strength at time of loading shall be determined by testing field cured concrete cylinders.

B. Extreme care shall be taken so that construction loads do not exceed design loading of the structure.

3.12 WATER TEST

A. All liquid retaining structures shall be water tested by CONTRACTOR before being faced with masonry or backfilled. The structure shall be filled with water, kept full for at least 24 hours, leaks or moist areas marked, and the structure or surrounding area drained. Repairs shall be made from the face of the concrete that is subjected to water pressure. Method of repair shall be reviewed by ENGINEER.

B. Testing of the structure shall not take place until the last concrete placed in the structure has developed 28 day design strength as determined by testing field cured concrete cylinders.

C. After repair, the structure shall again be tested as above. Testing and repair shall continue until all leaks or moist spots have disappeared. Unless otherwise stated, water for testing shall be supplied by CONTRACTOR.

3.13 NONSHRINK GROUT

A. Nonshrink, nonmetallic grout shall be used for filling recesses and pockets left for equipment installation and for setting of base plates. The material used shall be approved by ENGINEER. Store, mix, and place the nonshrinking compound as recommended by the manufacturer. The minimum compressive strength shall be 5,000 psi at age 7 days and 7,500 psi at age 28 days.

3.14 TESTING AND SAMPLING

A. The following tests of fresh concrete shall be performed by CONTRACTOR. CONTRACTOR shall prepare, protect, transport, and have tested all cylinders at his expense.
   1. Sampling of concrete for slump tests, air tests, temperature tests, and for making concrete test cylinders shall be performed in accordance with ASTM C172.
   2. Cylinders:
      a. Three test cylinders shall be made for each pour less than 25 cubic yards, four test cylinders shall be made for each pour between 25 and 100 cubic yards, and eight test cylinders shall be made for each pour in excess of 100 cubic yards. Each concrete mix shall be represented by at least four cylinders for the entire job. Concrete for cylinders shall be collected near the middle of the load and/or as requested by ENGINEER.
      b. Cylinders shall be made and tested in accordance with ASTM C31 and ASTM C39, respectively. The cylinders must be kept moist and at temperatures between 60°F and 80°F and shall remain undisturbed and stored in a location free from vibration. In hot weather, the cylinders shall be covered with wet burlap and stored in a shaded area. It is CONTRACTOR's responsibility to provide a suitable protected location for storing cylinders on the jobsite.
      c. After 24 hours, the cylinders shall be transferred to an independent testing laboratory acceptable to OWNER. The cylinders shall be packed in sawdust or other cushioning material for transit to avoid any bumping or jarring of the cylinders.
      d. Cylinders shall be broken at 7 and 28 days or as requested by ENGINEER. Test results shall be transmitted immediately and directly to ENGINEER and OWNER. Test data shall include date and location of pour and concrete mix used.
   3. Slump Test: CONTRACTOR shall make one slump test near the beginning of all pours with two tests being made for all pours in excess of 25 yards or as requested by ENGINEER. Slump tests shall conform to ASTM C143.
   4. Air Test:
      a. When air entrained concrete is used, the air content shall be checked by CONTRACTOR near the beginning of all pours with at least two checks being made for all pours in excess of 25 cubic yards, or as requested by ENGINEER.

b. The air contents shall be checked using the pressure method in accordance with ASTM C231. The pocket sized alcohol air indicator shall not be used unless it is first used in conjunction with the pressure method test.

B. All costs of additional testing and sampling of fresh or hardened concrete needed because of suspected or actual violation of the specifications shall be borne by CONTRACTOR.

3.15 RECORDS

A. A record is to be kept of all concrete work. The record shall include the date, location of pour, concrete mix, slump, air content, test cylinder identification, concrete temperature, and ambient air temperature. In addition, for cold weather concreting the record shall include the daily maximum minimum thermometer readings of all thermometers during the entire curing period for all concrete pours. The project representative will keep this record, and CONTRACTOR shall assist in obtaining needed information.

3.16 SIDEWALKS AND EXTERIOR SLABS

A. Sidewalks shall be constructed where shown on the drawings. They shall be a minimum of 5 inches thick and shall slope away from buildings or structures at a rate of 1/4 inch per foot unless otherwise specified on Drawings. Concrete shall be as previously specified. Sidewalks shall be constructed on 3 inches of compacted granular fill. They shall have tooled joints of 1 inch minimum depth at approximately 5 foot centers with 1/2 inch preformed expansion joint filler at approximately 25 foot centers with one at all corners and located anywhere sidewalks abut structures and buildings.

3.17 CONCRETE REMOVAL AND PATCHING

A. All areas disturbed as a result of concrete removal or repair shall be patched as specified in Bonding to Existing Concrete.

END OF SECTION

SECTION 04 20 00
UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Unit masonry, including the following:

1. Concrete masonry units (CMU):
2. Lintels.
3. Brick:
   a. Clay face brick.
4. Mortar and grout materials.
5. Reinforcement:
   a. Masonry-joint 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. Steel lintels in unit masonry.
2. Cavity wall insulation.

C. Related Sections:

1. Metal fabrications: Section 05 50 00.
2. Building thermal insulation: Section 07 21 00.
3. Fluid-applied membrane air barriers: Section 07 27 26.
4. Sheet metal flashing: Section 07 62 00.
5. Joint sealants: Section 07 92 00.

1.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days, as follows, based on net area:

1. f'm = 2,000 psi.

2. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602.
3. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Submit shop drawings indicating bar sizes, spacing, laps, locations and quantities of reinforcing steel, bending, cutting schedules and supporting devices. Indicate locations of openings, framing or special conditions affecting the work. Provide 1/4 inch scale elevations of walls showing reinforcing steel. Comply with ACI 315.

C. Samples:
1. Face Brick:
a. Furnish five bricks of each type proposed, through range of color.
2. Mortar: Color sample selection sets for mortar colorants.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for joint reinforcement, ties, anchors, membrane flashing, mortar net, preblended dry mortar mix, mortar colorants, repellents, and other accessories specified.

B. Certification:

1. Copies of certification showing compliance with the requirements for masonry units, including fire resistance ratings.
2. Copies of welding certificates for each welder involved in the Work.

C. Test Reports: Copies of test reports indicating compliance for the following:

1. CMU.
2. Face brick.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Joint reinforcement.
8. Anchors, ties, and metal accessories.

D. Mix Designs: Copies of grout mix design. 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 according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

F. Cleaning Procedures: Submit a written description of proposed masonry cleaning procedures, including the proposed materials and cleaning methods. Include masonry unit manufacturer's written approval of the proposed materials and methods.

1.5 QUALITY ASSURANCE

A. Comply with laws, ordinances, rules, regulations, and orders of public authorities having jurisdiction over this part of the Work.

B. Comply with the applicable recommendations of the TEK Information Series, National Concrete Masonry Association, (NCMA), in addition to the requirements specified herein.

C. Comply with the applicable recommendations of the Technical Notes on Brick Construction, The Brick Industry Association, (BIA), in addition to the requirements specified herein.

D. Provide copies of tests which have been performed in accordance with ASTM C 67; particularly for initial rate of absorption and efflorescence.

E. Comply with the requirements of TMS 402, Building Code Requirements for Masonry Structures and TMS 602, Specification for Masonry Structures.

F. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

G. Provide welding accordance with AWS, Standard Code for Arc and Gas Welding in Building Construction.

1.6 TESTING SERVICES

A. The testing laboratory will be responsible for conducting and interpreting tests, state in each report whether or not the test specimens conform to requirements of the Contract Documents and specifically note any deviations.

B. General requirements for testing are specified in Section 01 40 00 - Quality Requirements. Specific test and inspection requirements are specified herein.

C. Cooperate with laboratory personnel, provide access to Work, and manufacturer's operations, and provide and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used which require testing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and handle materials in such a manner as to avoid damage. Store unit masonry and packaged material above ground on wood pallets or blocking and protect from the weather until used. Immediately remove from the project site damaged or otherwise unsuitable material when so ascertained.

1.8 PROJECT CONDITIONS

A. Cold Weather Protection: During cold weather perform masonry work in accordance with the requirements in TMS 602, but not less than the following:

1. Receive, store, and protect construction materials in ways that prevent water from entering the materials.
2. If mean daily air temperature drops below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after restoration.
3. Produce consecutive batches of mortar with the same temperatures falling within this range. Provide mortar temperature after mixing and before use above 40 deg F maintainable either by auxiliary heaters under the mortar board or by more frequent mixing of mortar batches. Do not allow heated mortar to become hotter than 120 deg F.
4. Place masonry on sound unfrozen foundations.

B. Hot Weather Protection: During installation, when the air temperature exceeds 99 deg F in the shade, protect freshly laid masonry from direct exposure to wind and sun in accordance with requirements contained in TMS 602.

C. At the end of each day, or during a shutdown, protect the top surface of masonry to prevent moisture as rain, snow, or sleet from entering the masonry. Provide protection cover at the top of the wall surface and extend a minimum of 2 feet down sides of the masonry and secure in place to prevent blowing off. Maintain such protection until final capping of the walls.

D. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed, coated, or painted. Immediately remove grout, mortar, and soil from masonry.

1. Protect base of walls from rain splashed mud and from mortar splatter by coverings spread 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.

E. Repair masonry construction where required due to damaged or defective work and where required to accommodate work of other trades, in a manner so that patching is not visually apparent.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Manufacturers: the following manufacturers are listed with products using the shortened parenthetical name.

1. ACM Chemistries (ACM).
2. Arriscraft International, Lombard, IL 60148 (Arriscraft).
3. Master Builders Solutions.
4. Davis Colors (Davis).
5. Euclid Chemical Company (The); an RPM company (Euclid).
6. Essroc (Essroc).
7. GCP Applied Technologies Inc., Cambridge, MA 02140 (GCP).
8. Heckmann Building Products, Melrose Park, IL 60160 (Heckmann).
9. Hohmann & Barnard, Inc., Hauppauge, NY 11788 (H&B).
10. Holcim (US) Inc. (Holcim).
11. Illinois Products Corporation, Elmhurst, IL 60126 (IPCO).
12. Lafarge North America Inc. (Lafarge).
13. Lehigh Hanson; HeidelbergCement Group (Lehigh).
14. Mortar Net Solutions, Burns Harbor, IN 46304 (Mortar Net).
15. Northfield Block Company, Mundelein, IL 60060 (Northfield).
16. Polyguard Products, Inc., Ennis, TX 75120 (Polyguard).
17. Solomon Colors, Inc. (Solomon).
18. Wire-Bond, Charlotte, NC 28224 (Wire-Bond).

2.2 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 feet vertically and horizontally of a walking surface.

2.3 CONCRETE MASONRY UNITS

A. CMU, General: ASTM C 90 Normal weight unless otherwise indicated.

1. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
2. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

B. 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.

2.4 LINTELS

A. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Section 03 30 00 Cast-in-Place Concrete, and with reinforcing bars indicated.

B. 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.

2.5 BRICK

A. Clay Face Brick: Facing brick complying with ASTM C 216.

1. Face Brick No. 1: To match existing.
2. Grade: SW.
3. Type: FBS.
4. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested according to ASTM C 67.
5. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
6. Size (Actual Dimensions): 3-1/2 inches wide by 2-1/4 inches high by 7-1/2 inches long.
7. Color and Texture: As selected by Architect.

8. Provide special shapes and sizes shown on the Drawings finish color and texture to match face brick.
9. Provide solid face brick for headers with ends matching face brick.
10. Provide solid brick for brick with bed faces exposed, match face brick.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, 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.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products: Subject to compliance with requirements, provide one of the following:

a. "True Tone Mortar Colors" (Davis).
b. "Color-Crete Integral Color" (Euclid).
c. "SGS Mortar Colors" (Solomon).

E. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

F. Aggregate for Grout: ASTM C 404.

G. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

H. Water: Potable.

2.7 REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60, deformed.

B. Reinforcement Bar Positioners: 0.142 inch wire units designed to fit into mortar bed joints, to span masonry unit cells, and to hold reinforcing bars in center of cells. Provide hot-dip galvanized units designed for number of bars indicated. Provide one of the following:

1. "No. 376 Rebar Positioner" (Heckmann).
2. "RB Rebar Positioner" (H&B).

C. Masonry-Joint Reinforcement, General: ASTM A 951/A 951M.
1. Exterior Walls: Stainless steel.
2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Wire Size for Veneer Ties: 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall 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 made from materials that comply with the following unless otherwise indicated:

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 1064/A 1064M, with ASTM A 641/A 641M, Class B-2 coating.
2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304 or Type 316.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Stainless-Steel Sheet: ASTM A 240, UNS S30400 or UNS S31600.
5. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
6. Stainless-Steel Bars: ASTM A 276, UNS S30400.

C. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.060-inch-thick steel sheet, galvanized after fabrication or 0.062-inch-thick, stainless-steel sheet.

D. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.

1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.

2. Where wythes do not align or are of different materials, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel or stainless-steel wire.

E. 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 or stainless-steel wire.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch diameter, hot-dip galvanized steel or stainless-steel wire.

F. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- thick steel sheet, galvanized after fabrication or 0.109-inch- thick, stainless-steel sheet.
2. Tie Section: Triangular-shaped wire tie made from 0.187-inch-diameter, hot-dip galvanized steel or stainless-steel wire.
3. Corrugated-Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.075-inch- thick steel sheet, galvanized after fabrication or 0.078-inch- thick, stainless-steel sheet with dovetail tabs for inserting into dovetail slots in concrete.

G. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

H. Adjustable Masonry-Veneer Anchors:

1. General: Provide anchors that allow vertical adjustment but resist a 100-lbf load in both tension and compression perpendicular to plane of wall without deforming or developing play in excess of 1/16 inch.
2. Fabricate sheet metal anchor sections and other sheet metal parts from 0.075-inch-thick steel sheet, galvanized after fabrication or 0.078-inch- thick, stainless-steel sheet.
3. Fabricate wire ties from 0.187-inch- diameter, hot-dip galvanized-steel or stainless-steel wire unless otherwise indicated.

4. Contractor's Option: Unless otherwise indicated, provide any of the adjustable masonry-veneer anchors specified.
5. Screw-Attached, Masonry-Veneer Anchors: Wire tie and a rib-stiffened, sheet metal anchor section.
6. Seismic Masonry-Veneer Anchors: Connector section and rib-stiffened, sheet metal anchor section with screw holes top and bottom, with projecting tabs having slotted holes for inserting vertical leg of connector section. Connector section consists of a rib-stiffened, sheet metal bent plate with down-turned leg designed to fit in anchor section slot and with integral tabs designed to engage continuous wire.
7. Polymer-Coated, Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads, and with organic polymer coating with salt-spray resistance to red rust of more than 800 hours according to ASTM B 117.
8. Stainless-Steel Drill Screws for Steel Studs: ASTM C 954 except manufactured with hex washer head and neoprene or EPDM washer, No. 10 diameter by length required to penetrate steel stud flange with not less than three exposed threads; either made from Type 410 stainless steel or made with a carbon-steel drill point and 300 Series stainless-steel shank.

2.9 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual".

B. Stainless Steel Sheet: ASTM A 240/A 240M, Type 304, 2D Dull Finish:

1. Drip Edge: Minimum thickness 0.031 inch, formed as shown on the Drawings, if not shown, provide continuous 2 inch wide drip edge with front edge bent downward 1/2 inch at 45 degrees to form drip.
2. Flashing Support: Minimum 0.031 inch thick, formed as shown on the Drawings.

C. Membrane/Through Wall Flashing: Composite self-adhered in wall 40 mil thick membrane flashing consisting of a 32 mil thickness of rubberized asphalt compound integrally bounded to a 8 mil thickness of high density cross laminated polyethylene film with release paper on adhesive surface. Provide membrane flashing, surface primer and flashing mastic as manufactured by one of the following:

1. "Perm-A-Barrier Wall Flashing" (GCP).
2. "Ipco Wall Flashing"(IPCO).
3. "Polyguard Thru Wall Flashing" (Polyguard).

D. Prefabricated Membrane/Through Wall Flashing End Dams and Corners: Prefabricated lintel and sill end dams and inside and outside corner units, fabricated from a composite self-adhered in wall minimum 30 mil thick membrane flashing consisting of a minimum 26 mil thickness of rubberized asphalt compound integrally bounded to a minimum 4 mil thickness of high density cross laminated polyethylene film with release paper on adhesive surface. Masonry flashing ends, dams and flashing boot as provided by membrane/through wall flashing manufacturer.

2.10 ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene, urethane, or PVC.

B. Preformed Control Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D 226/D 226M, Type I (No. 15 asphalt felt).

D. Weep/Cavity Vent Products: Use one of the following unless otherwise indicated:

1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, 1/4 to 3/8 inch in diameter, in length required to produce 2-inch exposure on exterior and 18 inches in cavity. Use only for weeps.
2. 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.

E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.

1. Configuration: Provide one of the following:

a. Strips, full depth of cavity and 10 inches high, with dovetail-shaped notches 7 inches deep that prevent clogging with mortar droppings.
b. Strips, not less than 3/4 inch thick and 10 inches high, with dimpled surface designed to catch mortar droppings and prevent weeps from clogging with mortar.
c. Sheets or strips, full depth of cavity and installed to full height of cavity.
d. Sheets or strips not less than 3/4 inch thick and installed to full height of cavity, with additional strips 4 inches high at weeps and thick enough to fill entire depth of cavity and prevent weeps from clogging with mortar.

F. Loose-Fill Insulation: Perlite complying with ASTM C 549, Type II (surface treated for water repellency and limited moisture absorption) or Type IV (surface treated for water repellency and to limit dust generation).

G. Lightweight-Aggregate Fill: ASTM C 331/C 331M.

H. Proprietary Acidic Masonry Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

2.11 PROPORTIONING

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.

B. Mortar: Proportions by Volume: ASTM C 270:

1. Setting Mortar:
   a. Type N, Natural: One part portland cement, one part lime and six parts sand.
   b. Type S, Natural (only where specified or noted on the Drawings): One part portland cement, 1/2 part lime and 4-1/2 parts sand.
   c. Type M, Natural (for masonry in contact with or below grade): One part portland cement, 1/4 part lime and 3-3/4 parts sand.
2. Pointing Mortar: Same as setting mortar.
3. Colorants: Add as per manufacturer's printed instructions to provide color consistent throughout the entire project.

C. 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.

D. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C 476, Table 1.
3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

2.12 MIXING

A. Mix cementitious materials and aggregate in a mechanical batch mixer for at least 5 minutes with the minimum amount of water to produce a workable consistency.

Retemper mortar to replace water lost by evaporation, but not after mortar has begun to set. Use mortar within 2 hours after mixing.

B. Add colorants specified for mortar to be colored where shown on the Drawings. Mix in accordance with manufacturer's printed mixing instructions. Do not change proportioning the amount of colorant, material proportions or the type materials in the mix which could change the color tone.

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.

G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Lay concealed masonry with 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.

C. Build in items furnished by other trades and leave accurate openings necessary for subsequent installation of other work, in a manner to maintain required strength and appearance of masonry construction. Provide not less than 8 inches thickness of masonry between adjacent chases, openings, and recesses. Fill solidly around conduit and sleeves passing through masonry, with mortar.

D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. 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.

F. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

G. Build nonload-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. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.4 GENERAL – INSTALLATION

A. Face Brick:

1. Lay brick masonry units with mortar of types and strengths specified and as noted on Drawings. Install each masonry unit with full mortar coverage on adjoining ends, backs and bearing surfaces, as required to provide completely solid bed joints and head joints. Do not slush mortar into joints between units after laying. Keep voids clean and unobstructed of mortar or debris, including expansion joints, control joints, chases, cavities, and similar spaces.
2. Lay face brick units with running stretcher bond pattern unless shown otherwise on the Drawings in straight level courses, vertical joints evenly staggered, cross bonded at corners and outer faces of units made perfectly even, unless otherwise specifically indicated on Drawings.

B. CMU:

1. Lay units with full mortar coverage on horizontal and vertical face shells.
2. Bed webs courses of piers, columns, and pilasters, and in the starting course on footings and solid foundation walls, and where adjacent to cells or cavities to be reinforced or filled with grout or concrete. Lay solid units with full head and bed joints.

C. Construct interior masonry partitions exposed on both sides, 12 inches or more in thickness, in two wythes of masonry units.

D. Provide mortar joints 3/8 inch thick except where otherwise shown or noted on the Drawings. Tool joints when thumbprint hard with a round jointer. Cut flush joints with surface on unexposed interior surfaces.

E. Bond the facing and backing of multiple wythe masonry walls together with continuous joint reinforcement spaced 16 inches vertical. Also locate horizontal joint reinforcement in the joint immediately above lintels and immediately below sills.

1. Provide continuity at wall intersections by using prefabricated T-shaped units.
2. Provide continuity at corners by using prefabricated L-shaped units.

F. Provide preformed resilient filler strips specified, minimum 3/4 inch thick, between tops of walls and undersides of slabs, decks, beams and lintels, or against other abutting construction where shown on the Drawings. Set filler strips in joints as masonry is laid up with lengths of strips butted together and firmly compressed. Use solid masonry units or end units at such locations.

G. Structural Steel to Masonry Wall - Anchors and Ties:

1. Where indicated on the Drawings or required by conditions of the installation, provide flexible adjustable anchorage to column and beam steel framing.
2. Weld offset steel straps or channel slots to steel framing to allow for the insertion of triangular ties, web ties and/or strap anchors.
3. Provide triangular ties, web ties and/or strap anchors spaced as shown on the Drawings. If not shown, provide maximum spacing of ties and anchors 16 inches o.c. vertically and 32 inches o.c. horizontally.

H. Provide threaded steel anchors where indicated to be built into masonry construction for attachment of work by other trades. Conform to requirements of ASTM A 307 and include nuts with hardened washers where required. Provide minimum 1/2 inch shank diameter by 10 inch length with pigtail or J hook end, where size and type are not indicated on Drawings. Provide hot-dip galvanized anchors.

I. Cavity and Veneer Walls: Lay face brick in wythe with cavity as shown on the Drawings. Build in membrane flashing. Install two-piece horizontal joint cavity wall reinforcement 16 inches o.c. vertically unless noted otherwise on the Drawings. Keep cavity clear of mortar by placing a board of proper width across a level of joint reinforcement ties and after masonry reaches the next level of ties, lifting the board and removing mortar droppings before installing the next level of reinforcement.

1. Bevel the back edge of the mortar bed on the cavity side of each wythe to minimize mortar droppings into the cavity.
2. Mortar Deflection Mesh: Place mortar defection mesh immediately above top of flashing embedded in wall, as masonry construction progresses, to control splattered mortar droppings and to maintain cavity drainage.

J. Install weeps in exterior wythes and veneers in head joints of first course of masonry immediately above embedded flashing.

1. Use specified weep/cavity vent products to form weeps.
2. Space weeps 16 inches o.c. unless otherwise indicated.

3.5 PLACING JOINT REINFORCEMENT

A. Provide continuous joint reinforcement in horizontal joints of multi and single wythe masonry construction at 16 inches o.c. vertically, unless otherwise noted or shown on the Drawings.

B. Provide additional joint reinforcement in joint immediately above lintels, immediately below sills and at openings in walls and extend at least 2 feet beyond each side of opening.

C. Place units to provide continuous reinforcement, with manufacturer's standard corner and tee sections at wall intersections; splice units together by lapping side bars a minimum of 6 inches at adjoining ends of lengths.

D. Stop reinforcement 2 inches away from both sides of vertical control and building expansion joints.

E. Two-Piece Cavity Wall Ties: Install two-piece cavity wall reinforcement assemblies to provide continuous reinforcement of the concrete masonry inner wythe and pintle ties in the face brick outer wythe 15 to 16 inches o.c. horizontally.

1. Install continuous CMU backup reinforcement allowing for installation of cavity wall insulation.
2. Install pintle ties with legs down against the cavity wall insulation to hold insulation against face of inner wythe.
3. Install pintle ties with not more than 1/2 inch eccentricity of pintle tie legs.
4. Provide additional pintle ties within 8 inches of openings, lintels, vertical expansion joints and other discontinuities.
5. Stagger ties in alternate courses.

3.6 INSTALLATION OF VENEER ANCHOR ASSEMBLY

A. Install veneer anchors spaced not greater than 16 inches o.c. vertically and 16 inches o.c. attached directly to cold-formed metal stud framing.

B. Position veneer anchor over seal membrane and drive pronged legs thru membrane and sheathing to abut steel studs. Fasten anchors to steel studs using two per anchor, manufactured supplied self drilling/tapping screws.

C. Install veneer ties in each veneer anchor and bed in horizontal joint of face brick. Install veneer anchor assembly on each side of vertical control and building expansion joints.

D. Stop wire reinforcement 2 inches away from both sides of vertical control and building expansion joints.

3.7 INSTALLATION OF CAVITY WALL INSULATION

A. Install cavity wall insulation boards progressively as the wall is built. Install pintle ties to hold installation against face of inner wythe. Press insulation firmly against inner wythe and between wall reinforcement.

B. Butt boards tightly together and stagger vertical joints from the proceeding row. Maintain a clear uniform cavity between insulation and back of exterior brick wythe.

3.8 THROUGH WALL AND MEMBRANE FLASHING OF MASONRY WORK

A. Provide flashing in masonry work as shown on the Drawings and as required by the conditions of the construction. Prepare masonry surfaces smooth and free from projections which might puncture flashing. Install membrane and through wall flashing and accessories in accordance with the manufacturer's printed instructions.

B. Prime surfaces to which membrane flashing will be adhered. Precut flashing as required by conditions of each installation. Remove release paper, place flashing and press into place using a steel hand roller or back of a utility knife to assure adhesion to the surface to prevent water from migrating under the membrane.

C. Extend membrane into the inner wythe of cavity wall construction at sills, lintels, wall base, and other locations shown on the Drawings. Embed both ends of through wall flashing in the masonry as the wall is being constructed. Exposed horizontal edges of membrane are not acceptable.

1. Alternate Method: Extend membrane up inner wythe vertical surface not less than 16 inches and terminate with continuous stainless steel termination bar and sealant in accordance with the membrane manufacturer's printed installation instructions.

D. Veneer Walls: Extend membrane on to the exterior sheathing under the air and vapor barrier and up the vertical surface of the sheathing for not less than 16 inches.

E. Lap membrane a minimum of 2 inches at seams and press together to assure a watertight seal of the seams. Seal flashing penetrations cuts, and seam laps with membrane manufacturer's sealant before covering with mortar or masonry. Terminate or trim flashing membrane flush with face of wall unless otherwise shown on the Drawings.

F. At lintels, shelf angles and other locations shown on the Drawings, install minimum 0.031 inch stainless steel drip edge in joint and lap membrane over horizontal leg extended into wall. Install with only drip edge projected beyond the face of wall.

G. At locations where through wall flashing crosses the cavity or is unsupported by solid construction provide stainless steel sheet metal under unsupported flashing. Embed in masonry joints a minimum of two inches. Lap joints of sheets 2 inches and seal with a 2 inch wide piece of self adhered flashing centered over the lap joint.

H. Extend flashing beyond edge of lintels, shelf angles, sills and other embedded or built-in construction, a minimum of 4 inches and install prefabricated end dams to direct moisture to exterior. Adhere flashing and end dams to each other and seal seams of end dams and flashing with manufacturer's sealant.

I. Install specified prefabricated inside and outside corners at corners of through wall flashing. Adhere flashing to prefabricated units and seal seams of flashing and prefabricated corner units with manufacturer's sealant.

3.9 MOVEMENT JOINTS

A. Provide vertical movement (control and building expansion) joints in masonry where shown on the Drawings. If not shown on the Drawings, comply with the recommendations of NCMA for movement joints as reviewed by the Architect prior to construction of joint.

B. Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

C. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

D. Form expansion joints in brick using one of the following methods:

1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. 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 07 92 00 "Joint Sealants."

E. 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 07 92 00 "Joint Sealants," but not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

A. Install steel lintels where indicated.

B. Provide concrete or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for CMU-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.11 CONSTRUCTION TOLERANCES

A. Provide unit masonry construction within the following tolerances:

1. Maximum variation from plumb in vertical lines and surfaces of columns, walls and arrises:
   a. 1/4 inch in 10 feet.
   b. 3/8 inch in a story height not to exceed 20 feet.
   c. 1/2 inch in 40 feet or more.
2. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines:
   a. 1/4 inch in any story or 20 feet maximum.
   b. 1/2 inch in 40 feet or more.
3. Maximum variation from level of grades for exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines:
   a. 1/4 inch in any bay or 20 feet.
   b. 1/2 inch in 40 feet or more.
4. Maximum variation from plan location of related portions of columns, walls and partitions:
   a. 1/2 inch in any bay or 20 feet.
   b. 3/4 inch in 40 feet or more.
5. Maximum variation in cross sectional dimensions of columns and thicknesses of walls from dimensions shown on Drawings:
   a. Minus 1/4 inch.
   b. Plus 1/2 inch.

B. 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.

3.12 CLEANING MASONRY

A. Cut out any defective joints and holes in exposed masonry, repoint with mortar and tool.

B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joint.

C. Demonstrate cleaning procedure on sample wall area of 20 square feet in a location indicated by the Architect. Do not proceed with cleaning until the sample area has been reviewed by the Architect.

D. Clean initially with stiff fiber brushes and water. If a cleaning agent is required:

1. Submit written description of materials and methods for review by Architect prior to cleaning.
2. Follow brick manufacturer's recommendations.
3. Thoroughly wet surface of masonry on which no green efflorescence appears.
4. Scrub with acceptable cleaning agent.
5. Immediately rinse with clear water.
6. Do small sections at a time.
7. Work from top to bottom.
8. Protect sash, metal lintels and other corrodible parts when masonry is cleaned with corrosive solutions.
9. Remove green efflorescence in accordance with brick manufacturer's recommendations.

E. At the conclusion of masonry work, remove scaffolding, equipment used in the work, debris, refuse, and surplus material from premises.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to TMS 402.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.

F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

END OF SECTION

SECTION 05 40 00
COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Cold-formed metal framing, including but not limited to the following:

1. Load-bearing wall framing.
2. Exterior non-load-bearing wall framing.

B. Related Sections:

1. Delegated Design: Section 01 13 00.
2. Structural steel: Section 05 12 00.
3. Metal fabrications: Section 05 50 00.
4. Non-Structural Metal Framing: Section 09 22 16.
5. Gypsum board: Section 09 29 00.

1.2 DELEGATED DESIGN PERFORMANCE REQUIREMENTS

A. Design, engineer, fabricate, and install cold-formed steel framing work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.

B. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

C. Determine the size, thickness, and spacing, when not shown on the Drawings, of members, their connections to one another, and anchors to building structure using the following criteria:

1. Wind Loads: To resist wind pressures from any direction as required by building codes.
2. Other Loads: Design loads are those shown on the Drawings.
3. Maximum Allowable Deflection:

    a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
    b. Exterior Wall Framing for Aluminum Plate Wall Panels: Horizontal deflection of 1/240 of the span.
    c. Exterior Wall Framing for Stone Veneer Construction: Horizontal deflection of 1/600 of the span.
    d. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height under a horizontal load of 5 lbf/sq. ft.
    e. Floor Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

f. Ceiling Joist Framing: Vertical deflection of 1/360 of the span for live loads and 1/240 for total loads of the span.

4. Anchorage to steel or imbeds: Welded connections per AWS requirements.
5. Provide bolted or welded connections of cold-formed framing members.
6. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.

D. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing shall comply with AISI S100, AISI S200, and the following:

1. Floor and Roof Systems: AISI S210.
2. Wall Studs: AISI S211.
3. Headers: AISI S212.
4. Lateral Design: AISI S213.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Complete framing plans showing layout spacing, gauges of metal and dimensions of wall framing.
2. Show details of connections, welds, anchorage, bridging, bracing and splice details.
3. Indicate adjacent materials and construction to be attached to the wall framing.
4. Provide complete erection drawings.
5. Provide shop drawings sealed and signed by the same Engineer that prepared calculations.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for framing systems components and fire-rated and non-fire-rated deflection track.

B. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Architect but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

1. Attachment and anchorage to the building structure.
2. Load-bearing stud wall member sizes (if shown on Drawings or required by conditions).

C. Product Test Reports: For each listed product, for tests performed by a qualified testing agency.

D. Welder Certificates: Copies of welding certificates for each welder involved in the work.

E. Qualification Data: For Engineer.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

B. Provide materials and methods of installation in accordance with the current printed published instructions details and specifications of the Cold-Form Metal Framing Manufacturer for type of construction shown on the Drawings, except as hereafter modified and as approved by the Cold-Formed Metal Framing Manufacturer.

C. Fabricator/Installer Qualifications: Engage an experienced Fabricator/Installer with not less than 5 consecutive years experience, who has completed cold-formed metal framing similar in material, design, and extent to that indicated for this project and with a record of successful in-service performance.

D. Engineer Qualifications: *Professional* Engineer licensed in the State of Indiana and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store materials, components, and fabricated assemblies in such a manner as to avoid damage. Provide bundles of materials bearing the name of the manufacturer, size, gauge, and location of framing members.

B. Unload and store framing members and fabricated assemblies at the site in such a manner as to prevent distortion or damage to the members and the prime coat or galvanizing. Locate fabricated assemblies in areas of the site so as to limit the handling before installation in the construction. Store framing members, fabricated assemblies, and related materials so that they are not in contact with the ground, and so that they are properly supported, covered and kept dry.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. SCAFCO Steel Stud Company, Spokane, WA 99220.

B. Telling Industries, Streetsboro, OH 44094.

C. MBA Building Supplies, Libertyville, IL 60048.

D. Clarkwestern Dietrich Building Systems LLC., West Chester, OH 45069.

E. Marino/Ware, South Plainfield, NJ 07080.

2.2 MATERIALS

A. Steel for Cold-Formed Metal Framing - Studs and Tracks: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: 33, 37, 40, 50, Class 1; as required by structural performance.

B. Single Deflection Track: Manufacturer's single, deep leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure.

D. Fastenings: Bolts, nuts, washers, anchor and lag bolts and other fastenings necessary for proper fabrication and erection of items specified or required, hot-dip galvanized complying with ASTM A 123 and ASTM A 385 as applicable.

E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

F. Framing Accessories:Fabricate steel framing accessories of same material and finish used for framing members, with a minimum yield strength of 33,000 psi.
2. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
   a. Supplementary framing.
   b. Bracing, bridging, and solid blocking.
   c. Web stiffeners.
   d. Anchor clips.
   e. End clips.
   f. Foundation clips.
   g. Gusset plates.
   h. Stud kickers, knee braces, and girts.
   i. Joist hangers and end closures.
   j. Hole-reinforcing plates.
   k. Backer plates.

G. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

H. Anchor Bolts: ASTM F 1554, threaded carbon-steel bolts, carbon-steel nuts, and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

I. Post-Installed Anchors: Fastener systems with bolts of same basic metal as fastened metal, if visible, unless otherwise indicated; with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, as appropriate for the substrate.

J. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

K. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

L. Welding Electrodes: Comply with AWS standards.

M. Touch-up Paint: High zinc dust content, rust inhibiting paint complying with MIL-P-21035 (ships), and ASTM A 780/A 780M, compatible with galvanized surfaces.

N. Bituminous Paint: Asphalt emulsion, ASTM D 1187.

O. Nonmetallic, Nonshrink Grout: Factory-packaged, nonmetallic, noncorrosive, nonstaining grout, complying with ASTM C 1107/C 1107M, and with a fluid consistency and 30-minute working time.

2.3 PROTECTIVE COATING

A. Coat steel fabrications and framing components that will be in contact with concrete and masonry or where the possibility of galvanic action may occur with a heavy coat of bituminous paint. Do not extend coating onto finish surfaces.

2.4 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.

2. Cut framing members by sawing or shearing; do not torch cut.
3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.

    a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
    b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.

4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies to be level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

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

3.2 PREPARATION

A. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.

a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

D. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

E. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

G. Install insulation, specified in Section 07 21 00 "Building Thermal Insulation," in framing-assembly members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at 24 inches o. c. unless otherwise indicated on Drawings.

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track. Fasten both flanges of studs to top and bottom tracks.

1. Stud Spacing: 16 inches unless otherwise indicated on Drawings.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically unless otherwise indicated on Drawings. Fasten at each stud intersection.

J. Install steel sheet diagonal bracing straps to both stud flanges; terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

L. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 ERECTION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.6 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 05 50 00
METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Metal fabrications, including the following:

1. Loose lintels.
2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
3. Miscellaneous angles, shapes and fabrications shown on the Drawings.
4. Anchors, framing, fasteners and accessories for installation of the above.
5. Design calculations for those items required to have such.

B. Related Sections include the following:

1. Cast-in-Place Concrete: Section 03 30 00.
2. Unit Masonry: Section 04 20 00.
3. Structural Steel Framing: Section 05 12 00.
4. Painting: Section 09 91 00.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design, engineer, fabricate, and install metal fabrications work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.
2. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

B. Exterior Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

C. Information on Drawings and in the Specifications establishes requirements for system's aesthetic effects and performance characteristics. Aesthetic effects are indicated on the Drawings by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines and relationships to one another and to adjoining construction. Performance characteristics are indicated by criteria specified herein subject to verification as specified.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's written approval and only to the extent needed to comply with performance requirements. Where modifications are proposed, submit comprehensive explanatory data to Architect in accordance with Section 01 60 00 "Product Requirements" for review prior to submittal of shop drawings.

1.3 ACTION SUBMITTALS

A. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. Where fabrications require calculations, provide shop drawings sealed and signed by the same qualified Engineer that prepared calculations.

1.4 INFORMATIONAL SUBMITTALS

A. Product Data: For the following:

1. Grout.
2. Primers.

B. Welding certificates.

C. Qualification Data: For Engineer.

D. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Architect but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

1. Metal pan (open grating, steel floor plate) stairs.
2. Handrails, railings, and guardrails.
3. Gratings and supports.
4. Toilet partition support framing.
5. Countertop support framing.

1.5 QUALITY ASSURANCE

A. Engineer Qualifications: Professional Engineer licensed in the State of Indiana and experienced in providing engineering services of the kind indicated that have

resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

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

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.1, Structural Welding Code--Steel.
2. AWS D1.2, Structural Welding Code--Aluminum.
3. AWS D1.3, Structural Welding Code--Sheet Steel.
4. AWS D1.6, Structural Welding Code--Stainless Steel.

D. Comply with AISC Manual.

1. Code of Standard Practice for Steel Buildings and Bridges.
2. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings.

E. Specifications for Structural Joints Using High Strength Steel as approved by the Research Council on Structural Connections.

F. General Requirements for Delivery of Rolled Steel Plates, Shapes, and Bars for Structural Use: ASTM A 6.

G. Qualifications for Welding Work:

1. Qualify welding processes and welding operators in accordance with the AWS, Standard Qualification Procedure.
2. Provide certification that welders to be employed in the work have satisfactorily passed AWS qualification tests within the previous twelve months. Provide recertification of welders as required.

H. Comply with applicable portions of National Association of Architectural Metal Manufacturers (NAAMM) Metal Stairs and Pipe Railing Manuals.

1.6 PROJECT CONDITIONS

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

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.7 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to project site in time for installation.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS - GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 MATERIALS

A. Stainless Steel:

1. Bars and Shapes: ASTM A 276, UNS S30400.
2. Sheet, Plate and Strip, ASTM A 240, UNS S30400, minimum thickness 0.056 inch, mill flattened, stretcher leveled.
3. Pipe and Tubing: ASTM A 554, Grade MT-304.
4. Pipe: ASTM A 312, UNS S30400.

B. W-Shapes: ASTM A 992, Grade 50.

C. Channels and Angles: ASTM A 36.

D. Steel Plates, Shapes, and Bars: ASTM A 36.

E. Steel Sheet:

1. Cold-Rolled: ASTM A 1008, Type B, structural steel, Grade 25, unless another grade is required by design loads indicated.
2. Hot-Rolled: ASTM A 1011, Type B, or structural steel, Grade 30, unless another grade is required by design loads.
3. Perforated metal: galvanized-steel sheet, ASTM A 653/A 653M, G90 coating, commercial steel Type B. Coil coated in accordance with AAMA 621.

F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Series 300 stainless steel fasteners for exterior use and zinc plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M, Grade A325, Type 3, heavy-hex steel structural bolts; ASTM A 563, Grade DH3, heavy-hex carbon-steel nuts; and where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

D. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc coated anchor bolts where item being fastened is indicated to be galvanized.

E. Eyebolts: ASTM A 489.

F. Machine Screws: ASME B18.6.3.

G. Lag Bolts: ASME B18.2.1.

H. Wood Screws: Flat head, ASME B18.6.1.

I. Plain Washers: Round, ASME B18.22.1.

J. Lock Washers: Helical, spring type, ASME B18.21.1.

K. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.
3. Provide one of the following:
   a. "Kwick Bolt 3" (Hilti Corporation, Tulsa, OK 74121).
   b. "Expansion Anchors" (Dur-O-Wall, Hauppauge, NY, 11788).
   c. "Expansion Anchors" (ITW Redhead, Addison, IL 60101).

L. Power Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load equal to ten times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency. Provide manufacturer's substantiating data for each type and condition used as part of submittals.

M. Chemical Fasteners: Insert type stud bonding system anchor for use with hardened portland cement concrete, and tension and shear capacities appropriate for application.

1. Bonding Material: ASTM C 881, Type IV, Grade 3, two component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
2. Stud: ASTM A 307, zinc coated carbon steel with continuous thread on stud, unless otherwise indicated.
3. Washer and Nut: Zinc coated steel.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Use primers with a VOC content of 3.5 lb/gal. or less when calculated according to 40CFR59, Subpart D (EPA Method 24).

1. Universal Shop Primer: Fast curing, lead and chromate free, universal primer.
   a. Use primer containing pigments that make it easily distinguishable from zinc rich primer.
   b. Provide one of the following:
      1) "Carboguard 635" (Carboline Company, St. Louis, MO 63144).
      2) "Series 135 Chembuild" (Tnemec, Company, Inc., Kansas City, MO 64141).
      3) "Amercoat 4180" (PPG).
2. Zinc Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.
   a. Provide one of the following:
      1) "Carbozinc 621" (Carboline Company).
      2) "Amercoat 68HS" (PPG).
      3) "Tneme-Zinc 90-97" (Tnemec Company, Inc.).

C. Galvanizing Repair Paint: High zinc dust content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold applied asphalt emulsion complying with ASTM D 1187.

E. Nonshrink, Nonmetallic Grout: Factory packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

F. Concrete Materials and Properties: Comply with requirements in Section 03 30 00 - Cast-in-Place Concrete for normal weight, air entrained, ready mix concrete with a minimum 28-day compressive strength of 3,000 psi, unless otherwise indicated.

2.5 FABRICATION - GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts, unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

2.6 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.7 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

1. Furnish inserts if units are installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition shop drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc rich primer where indicated.

2.8 FINISHES - GENERAL

A. Comply with NAAMM's - Metal Finishes Manual for Architectural and Metal Products for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.9 STEEL FINISHES

A. Galvanizing: In addition to items and fabrications indicated herein and on the Drawings, galvanize exterior items, products, and fabrications unless indicated otherwise. Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123 for galvanizing steel and iron products.
2. ASTM A 153 for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) (and Items Indicated to Receive Zinc Rich Primer): SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
2. Interiors (SSPC Zone 1A): SSPC-SP-3, Power Tool Cleaning.

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA-1, Paint Application Specification No.1, Shop, Field, and Maintenance Painting of Steel, for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

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

B. Anchor supports for operable partitions securely to and rigidly brace from building structure.

3.3 ADJUSTING AND CLEANING

A. Touch-up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0 mil dry film thickness.

B. Touch-up Painting: Cleaning and touch-up painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 09 91 00 - Painting.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

3.4 INSPECTION AND TESTS

A. The testing laboratory will make inspections and perform tests in accordance with the following:

1. Verify that certification of welders is not more than one year prior to time welding work is to be performed.
2. Visually inspect shop and field welds. Conform with AWS D1.1., Structural Welding Code for Steel.
3. Test bolted connections made either in the shop or in the field in accordance with the following:
    a. Test bolted connections by the calibrated wrench method as outlined in the Specifications for Assembly of Structural Joints Using High Strength Steel Bolts hereinbefore specified. The testing laboratory is responsible for the proper calibration of the wrench used.
    b. Test 10 percent of installed bolts as specified, with a minimum of two bolts for each connection being tested.

B. Correct deficiencies in metal fabrication work which inspections and tests have indicated to be in non-compliance with the requirements of the Contract Documents. Perform additional tests, at Contractor's expense as may be necessary to reconfirm any noncompliance or original work, and as may be necessary to show compliance of corrected work.

END OF SECTION

SECTION 06 10 00
ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. Rough carpentry and framing, including the following:
   1. Wood framing, blocking, furring, nailers, and grounds for the anchor or support of other items or construction as necessary to render the work secure and complete.
   2. Anchors, fasteners, and hardware.

B. Related Sections:
   1. Cold-formed metal framing: Section 05 40 00.
   2. Gypsum board: Section 09 29 00.

1.2 QUALITY ASSURANCE

A. Grading Rules:
   1. Provide lumber conforming to the grading rules and wood species of the DOC Voluntary Product Standard PS-20. Grading rules of the following associations also apply to materials produced under their supervision:
      a. Northeastern Lumber Manufacturer's Association, Inc. (NELMA).
      b. Southern Pine Inspection Bureau (SPIB).
      c. West Coast Lumber Inspection Bureau (WCLIB).
      d. Western Wood Products Association (WWPA).

B. Grading Marks: Identify lumber and plywood by official grade mark.
   1. Lumber: Grade stamp to contain symbol of grading agency, mill number or name, grade of lumber, species or species grouping or combination designation, rules under which graded, where applicable and condition of seasoning at time of manufacture.
      a. S-Dry: Maximum 19 percent moisture content.
      b. MC-5 or KD: Maximum 15 percent moisture content.
      c. Dense.

1.3 DELIVERY, STORAGE AND HANDLING

A. Immediately upon delivery to job site, place materials in area protected from weather.

B. Store materials a minimum of 6 inches above ground on framework or blocking and cover with protective waterproof covering, providing adequate air circulation or ventilation.

C. Do not store seasoned materials in wet or damp areas.

D. Protect materials against high humidity and moisture during storage and erection.

E. Protect sheet materials from corners breaking and damaging surfaces, while unloading.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Lumber:
   1. Dimension:
      a. Specified lumber dimensions are nominal.
      b. Actual dimensions conform to industry standards established by the American Lumber Standards Committee and the rules writing agencies.
   2. Moisture Content: 19 percent maximum at time of permanent closing in of building or structure for lumber 2 inches or less nominal thickness.
   3. Surfacing: Surface four sides (S4S), unless otherwise shown on the Drawings or specified.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive the parts of the work specified herein. Verify dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of existing conditions.

3.2 INSTALLATION

A. General: Frame wood members to a close fit, set accurately to required lines and levels and secure rigidly in place in accordance with the Drawings. Cut to fit framing, blocking, etc. to accommodate other work.

B. Blocking:
   1. Install in continuous horizontal row to mid-height of single story partitions over 8 feet high and multi-story partitions.
   2. Wedge, align and anchor blocking with countersunk bolts, washers and nuts or nails.
   3. Locate blocking to facilitate installation of finishing materials, fixtures, specialty items and trim.

END OF SECTION

SECTION 07 01 55
ROOF PATCHING AND REPAIRS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes procedural requirements for roof patching and repairs.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to work of this Section.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. Meet with Owner, Architect, Owner's insurer if applicable, and installers whose work interfaces with or affects roofing, roof accessories, and roof-mounted equipment.
2. Review methods and procedures related to roofing, including, but not limited to, the following:

    a. Preparation, including roofing system manufacturer's written instructions.
    b. Temporary protection requirements for existing roofing system components.
    c. Existing roof drains and roof drainage.
    d. Existing roof deck conditions requiring Architect notification.
    e. Owner notifications.
    f. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
    g. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect roof patching and repairs.
    h. HVAC shutdown and sealing of air intakes.
    i. Shutdown of fire-suppression, -protection, and -alarm and -detection systems.
    j. Existing conditions that may require Architect notification before proceeding.

1.4 ACTION SUBMITTALS

A. Product data: for items specified herein.

B. Description of roof patching system.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

1. Include certificate that Installer is approved by warrantor of existing roofing system.

1.6 CLOSEOUT SUBMITTALS

A. Certified statement from manufacturer for existing warranted roof system stating that existing roof warranty has not been affected by Work performed under this Section.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

1.8 PROJECT CONDITIONS

A. Owner will occupy portions of building immediately below roof patching and repairs area.

1. Provide Owner with not less than 72 hours written notice of activities that may affect Owner's operations.
2. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.

B. Protect building, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from roofing operations.

C. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

D. Weather Limitations: Proceed with roofing work only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

E. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Owner.

1.9 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during Work, by methods and with materials so as not to void existing roofing system warranty issued by manufacturer for existing warranted roof system.

1. Notify warrantor before proceeding with the Work.
2. Notify warrantor of existing roofing system on completion of Work, and obtain documentation verifying that existing roofing system has been inspected and warranty remains in effect.

a. Submit documentation at Project closeout.

B. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ROOFING MATERIALS

A. Design and selection of materials for roof patching and repairs are Contractor's responsibilities.

2.2 INFILL AND REPLACEMENT MATERIALS

A. Use infill materials matching existing roofing system materials unless otherwise indicated.

2.3 AUXILIARY MATERIALS

A. General: Use auxiliary roofing materials recommended by roofing system manufacturer for intended use and compatible with components of existing roofing system.

PART 3 - EXECUTION

3.1 PROTECTION

A. Protection of In-Place Conditions:

1. Protect existing roofing system.
2. Limit traffic and material storage to areas of existing roofing that have been protected.
3. Comply with requirements of existing roof system manufacturer's warranty requirements.

B. Test existing roof drains to verify that they are not blocked or restricted.

C. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.

D. During operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

E. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

3.1 DECK INSPECTION

A. Inspect deck of roofing system.

B. If broken or loose fasteners are observed, immediately notify Architect.

C. If structural integrity of deck is suspect, immediately notify Architect.

3.1 BASE FLASHING REMOVAL

A. Do not damage metal counterflashings that are to remain.

1. Replace metal counterflashings damaged during Work with counterflashings of same metal, weight or thickness, and finish as existing.

B. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage.

1. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

END OF SECTION

SECTION 07 21 00
BUILDING THERMAL INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Building thermal insulation, including the following:

1. Rigid foundation insulation.
2. Semi-rigid exterior wall insulation.
3. Faced and unfaced blanket insulation.
4. Accessories and incidental materials required for installation of the above.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Cold-formed metal framing: Section 05 40 00.
4. Joint sealants: Section 07 92 00.
5. Aluminum curtain walls: Section 08 44 13.
6. Glazing: Section 08 80 00.

1.2 ACTION SUBMITTALS

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

1.3 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

B. Fire Test Response Characteristics: Provide insulation and related materials with the fire test response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

1. Surface Burning Characteristics: ASTM E 84.
2. Fire Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

C. Formaldehyde Free: Provide formaldehyde free products.

D. Recycled Content: Provide glass and rock wool fiber insulation with recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 10 percent.

1.4 DELIVERY, STORAGE, AND HANDLING

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:

1. Diversifoam Products, Rockford, MN 55373.
2. The Dow Chemical Co., Midland MI 48674.
3. Owens-Corning, Parsippany, NJ 07054.
4. Johns Manville, Denver, CO 80217.
5. CertainTeed (A subsidiary of Saint-Gobain), Malvern, PA 19355.
6. Rock Wool Manufacturing, Leeds, AL 35094.
7. Rockwool International A/S, Milton, Ontario, Canada L9T 6W3.
8. Thermafiber, Inc. (an Owens Corning company), Wabash, IN 46992.
9. Knauf Insulation, Shelbyville, IN 46176.

2.2 RIGID BOARD INSULATION

A. Foundation Insulation Board: Extruded polystyrene foam board, square edge, conforming with ASTM C 578, Type IV; minimum R-Value of 10.0 at 40 deg F mean temperature for 2 inch thickness, compressive strength 25 psi minimum design value, thickness as shown on the Drawings (if not shown provide 2 inch thick boards). Drainage panels fabricated with shiplap or channel edges and with one side having grooved drainage channels. One of the following:

1. “CertiFoam 25” (Diversifoam Products).
2. “Styrofoam” (The Dow Chemical Co.).
3. “Foamular” (Owens-Corning).

B. Foundation Insulation Board Adhesive: Type recommended by insulation board manufacturer for the types of substrate indicated on the Drawings.

2.3 SEMI-RIGID BOARD INSULATION

A. Mineral Fiber: Boards of rock or slag, minimum 4.0 pound per cubic foot, R=4.2 per inch thickness, conforming with ASTM C 612, Type 1A, thickness as shown on the Drawings:

1. “CurtainRock” (Rockwool).

2. "Firespan 40" (Thermafiber).
3. "MinWool Curtainwall" (Johns Manville).

B. Cavity Insulation (Rain Screen Installations): Mineral fiber boards of rock or slag, R=4.2 per inch thickness, conforming with ASTM C 612, Type IVB, thickness as shown on the Drawings. Provide one of the following:

1. "CavityRock" (Rockwool).
2. "RainBarrier" (Thermafiber)

2.4 BATT (BLANKET) INSULATION

A. Mineral Wool Fiber:

1. Exterior Wall and Soffit Insulation: Blankets of rock or slag conforming with ASTM C 665, thickness as shown on Drawings.
   a. "Comfortbatt" (Rockwool).
   b. "UltraBatt" (Thermafiber).
2. Miscellaneous Exterior Building Voids: Blankets of rock or slag unfaced conforming with ASTM C 665 Type I, thickness as shown on Drawings.
   a. "UltraBatt" (Thermafiber).
   b. "Comfortbatt" (Rockwool).
   c. "Min Wool" (Industrial Insulation Group, Johns Manville).

2.5 INSULATION FASTENERS

A. Adhesively Attached, Spindle Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and complying with the following requirements:

1. Products:
   a. "Series T TACTOO Insul-Hangers" (AGM Industries, Inc.).
   b. "Stic-Klip Type N fasteners" (Eckel Industries of Canada).
   c. "Spindle Type" (Gemco).
2. Plate: Perforated galvanized carbon steel sheet, 0.030 inch thick by 2 inches square.
3. Spindle: Copper coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Insulation Retaining Washers: Self-locking washers formed from 0.016 inch thick galvanized steel sheet, with beveled edge for increased stiffness, sized as required to hold insulation securely in place, but not less than 1-1/2 inches square or in diameter.

1. Products:
   a. "RC150" (AGM Industries, Inc.).
   b. "SC150" (AGM Industries, Inc.).
   c. "Dome-Cap" (Gemco).
   d. "R-150" (Gemco).
   e. "S-150" (Gemco).

C. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products:
   a. "TACTOO Adhesive" (AGM Industries, Inc.).
   b. "Stic-Klip Type S Adhesive" (Eckel Industries of Canada).
   c. "Tuff Bond Hanger Adhesive" (Gemco).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.

3.3 INSTALLATION - GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.

B. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

C. Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

D. For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units

to substrate with mechanical anchorage to provide permanent placement and support of units.

B. Blanket: Install batt insulation in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, 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.
4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically by wire or strapping space not more than 2 feet on center and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Board: Install board insulation in curtain wall construction where indicated on Drawings according to curtain wall manufacturer's written instructions.

1. Retain insulation in place by metal spindle type anchors spaced at intervals in accordance with the insulation manufacturer print installation instructions to hold insulation securely in place. Maintain space width of dimension indicated between substrate material and insulation.

D. Stuff loose fill insulation into miscellaneous voids and cavity spaces where shown. Compact to approximately 50 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft.

3.5 INSTALLATION OF RIGID FOUNDATION INSULATION BOARD

A. Application Methods (one of the following):

1. Spot Method: Apply spots of adhesive (approximately 1 inch diameter x 3/4 inch high) located about 8 inches to 12 inches o.c. alternatively spaced beginning at a corner of the board. (Larger spots may be required to compensate for uneven or irregular wall surfaces.) Install board within the time limit allowed by the adhesive.
2. Ribbon Application Method: Using mechanical applicator, such as hand caulking gun or pneumatic dispenser, extrude ribbons 6 inches in length, 12 inches o.c. the full length of board. Apply 3 lines of ribbons on the board, one along centerline and the other two about 3 inches in from the long edges. Apply ribbons a nominal 5/16 inch in diameter. Install board within the time limit allowed by the adhesive.

B. Installation on Foundation Walls: Place foundation insulation boards specified over areas and against foundation walls where indicated. Adhere vertical boards to surfaces with adhesive using spot method or ribbon application method hereinbefore specified. Lay horizontal boards loose over moisture barrier provided by others. Place insulation boards with closely butted joints over the entire area to be insulated.

3.6 PROTECTION

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

END OF SECTION

COMPARED TO MASTERSPEC SECTION 072100 FL - Thermal Insulation (03/19).

ROCKWOOL PRODUCTS VERIFIED. (AUG 2019)

MOVED DEFINITIONS FROM LEED TEXT TO SEPARATE ARTICLE (APR 2020).

Updated non-rainscreen mineral wool products (APR 2021)

Moved spandrel insulation to appropriate Division 8 section (APR 2021)

SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Single-component, elastomeric vapor permeable spray applied liquid membrane designed to resist air and water when applied to surfaces while remaining vapor permeable to the passage of water vapor from the building interior, including the following:

1. Transition and through-wall flashing membrane.
2. Sealants.
3. Primer and adhesives.
4. Associated materials required for a complete air barrier system installation.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Cold-formed metal framing: Section 05 40 00.
3. Joint Sealants: Section 07 92 00.
4. Gypsum board: Section 09 29 00.

1.2 ACTION SUBMITTALS

A. Product data: for items specified herein.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and recommended installation methods.

B. Certification: Substantiating data that membrane material complies with property requirements.

1.4 QUALITY ASSURANCE

A. Product Source: Provide air barrier membrane materials from a single manufacturer to the greatest extent possible. Provide secondary materials as the products of the manufacturer of the air barrier membrane.

B. Provide materials, methods, and details of installation in accordance with the current printed published instructions and specifications of the Air Barrier Membrane Manufacturer for the types of substrates and installations shown on the Drawings, except as hereafter modified and as approved by the Air Barrier Membrane Manufacturer.

C. Installer Qualifications: The Air Barrier Installer is to be acceptable to the Manufacturer of the air barrier materials and is to have a minimum of 5 years experience in air barrier projects of similar size and complexity. The Air Barrier Installer is to also be a Certified (approved) Installer of the Air Barrier Products and provide evidence of same upon request.

D. Manufacturer Requirements: The manufacturer of the air barrier membrane is to provide a representative for inspection of the air barrier membrane during installation and upon completion to ascertain that the air barrier membrane has been installed in accordance with the manufacturer's current published instructions, specifications and details, and this Section.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original, unopened containers.

B. Containers to be labeled with manufacturer's name, brand name, installation instructions and identification of various items.

C. Store materials and handle in accordance with the manufacturer's written instructions. Follow manufacturer's instructions on safety.

D. Store materials in dry area and protect from water and direct sunlight. Remove and replace damaged materials.

1.6 PROJECT CONDITIONS

A. Weather Conditions: Proceed with air barrier membrane work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the Work to proceed in accordance with requirements and the manufacturer's recommendations.

B. Substrate Conditions:

1. Proceed with air barrier membrane work only after substrate construction and penetrating work have been completed.
2. Do not apply air barrier materials to frozen or frosted surfaces nor during period of snow or rain.
3. Do not apply air barrier materials to wet surfaces.
4. Verify that surfaces have been cured for not less than 7 days before application of materials.

C. Sequencing Protection:

1. Sequence operations to avoid exposure of the work to the elements.
2. Provide protection from the elements.
3. Provide protection of the construction from damage by the membrane installation operations. Repair or replace construction so damaged.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. GCP Applied Technologies, Cambridge, MA 02140.

B. Henry Company, El Segundo, CA 90245.

C. Tremco Commercial Sealants & Waterproofing, Beachwood, OH 44122.

2.2 MATERIALS

A. Basis-of-Design Product: This Section is based on the products and installation methods of "Air-Bloc 17 MR" (Henry Company), comparable products and installation methods of the listed products are acceptable.

B. Vapor Permeable Liquid Air Barrier Membrane: One component liquid polymer elastomeric membrane, spray applied and having the following characteristics:

1. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. when applied to concrete masonry units and tested in accordance with ASTM E 2178.
2. Water Vapor Permeance: Not less than 10.0 perms when tested in accordance with ASTM E 96, Desiccant Method, Procedure A.
3. Assembly Performance: Provide a continuous air barrier assembly with an air leakage not to exceed 0.04 cfm/sq.ft. of surface area under a pressure differential of 1.57 pounds per square foot when tested in accordance with ASTM E 2357.
4. Products:
   a. "Air-Bloc 17 MR" (Henry Company)
   b. "Perm-A-Barrier VP" (GCP Applied Technologies).
   c. "ExoAir 220" (Tremco).

C. Transition Membrane (Self-Adhering): SBS modified bitumen, self-adhering sheet membrane integrally bonded to cross laminated polyethylene film sheeting, formed into uniform flexible sheets. Air Barrier Manufacturer's standard product having the following physical properties:

1. Thickness: 40 mils minimum.
2. Air leakage: <0.01 L/s·m² at 75 Pa to ASTM E 283.
3. Vapor Permeance: 2.8 ng/Pa.m².s (0.05 perms) to ASTM E 96.
4. Elongation: 200 percent to ASTM D 412 – modified.
5. Basis-of-Design Product: "Blueskin" (Henry Company).

D. Through-Wall Flashing Membrane (Self-Adhering): SBS modified bitumen, UV resistant, self-adhering sheet integrally bonded to cross laminated polyethylene film sheeting, formed into uniform flexible sheets. Air Barrier Manufacturer's standard product recommended in writing by air barrier manufacturer to produce a complete air barrier assembly and that are compatible with primary air-barrier material and adjacent construction to which they may seal.

E. Primer for Self-Adhering Membrane: As recommended for substrate by air-barrier material manufacturer.

F. Termination Mastic: Air Barrier Manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

G. Stainless Steel Sheet Drip Edge: ASTM A 240, UNS S30400, minimum thickness 0.056 inch, 2D dull finish, formed as shown on the Drawings, if not shown, provide continuous 2 inch wide drip edge with front edge bent downward 1/2 inch at 45 degrees to form drip.

H. Sealants: as recommended by the Air Barrier Manufacturer, refer to Section 07 92 00.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive the parts of the Work specified herein. Application and installation of materials constitutes acceptance of the substrates and existing conditions.

B. Verify that surfaces are sound, dry, clean and free of oil, grease, dirt, or other contaminants.

1. Do not apply membrane air barrier until penetrations, including veneer masonry tie anchors, through the membrane have been installed.
2. Do not apply air barrier membrane in wet weather, unless requirements of the manufacturer are complied with, and then only in accordance with manufacturer's instructions and concurrence of the Architect.

C. Clean substrate of debris and deleterious materials which would impair the Work:

1. Do not apply membrane to areas previously treated with curing compounds unless these have been completely removed.
2. Verify surfaces for moisture and chemical compatibility.

D. If deteriorated materials and/or surfaces are encountered, immediately contact the Architect.

E. Install air barrier membrane and related materials in accordance with the manufacturer's current printed installation instructions, specifications, and details.

3.2 JOINT TREATMENT

A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.

1. Prime substrate and apply a single thickness of air barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.

B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.3 INSTALLATION OF TRANSITIONS

A. Primer for Transition and Through-wall Flashing Membrane:

1. Apply primer for self-adhering membranes at rate recommended by manufacturer.
2. Apply primer to areas to receive transition membrane and/or through-wall flashing membrane as indicated on the Drawings by roller or spray and allow minimum 30 minute open time.
3. Reprime surfaces not covered by transition membrane or through-wall flashing membrane during the same working day.

B. Transition Membrane:

1. Align and position self-adhering transition membrane, remove protective film and press firmly into place. Ensure minimum 2 inch overlap at end and side laps.
2. Tie-in to window frames, hollow metal door frames, spandrel panels, roofing system and at the interface of dissimilar materials as indicated on the Drawings.

3. Promptly roll laps and membrane with a countertop roller to affect seal.
4. Ensure preparatory work is complete prior to applying the liquid air barrier.

C. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition membrane or preformed silicone-sealant extrusion as standard with manufacturer 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.

1. Transition membrane: Roll firmly to enhance adhesion.
2. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.

D. Through-Wall Flashing Membrane:

1. Align and position the leading edge of self-adhering through-wall flashing membrane with the front horizontal edge of the foundation walls, lintels and shelf angles, partially remove protective film and roll membrane over surface and up vertically.
2. Press firmly into place. Ensure minimum 2 inch overlap at end and side laps.
3. Promptly roll laps and membrane to effect the seal.
4. Ensure preparatory work is complete prior to applying through-wall flashing membrane.
5. Ensure through-wall flashing membrane extends fully to the exterior face of the exterior masonry veneer.
6. Trim off excess.
7. Apply through-wall flashing membrane along the base of masonry veneer walls, over windows, doors and other wall openings. Install and form membrane as a continuous flashing and extend a minimum of 8 inches up the backup wall.
8. Install closed end dams fabricated for through-wall flashing membrane at ends of lintels and shelf angles.
9. At lintels and shelf angles install minimum 22 gage stainless steel drip edge in joint and lap membrane over horizontal leg extended into wall.

E. At end of each working day, seal top edge of transition membranes to substrate with termination mastic.

F. 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.

3.4 INSTALLATION OF LIQUID AIR BARRIER

A. General: Apply fluid air barrier material to form a seal with transition membranes and to achieve a continuous air barrier according to air barrier manufacturer's written instructions. Apply fluid air barrier material within manufacturer's recommended application temperature ranges.

1. Apply primer to substrates at required rate and allow it to dry.
2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
3. Prime glass-fiber-surfaced gypsum sheathing with number of prime coats needed to achieve required bond, with adequate drying time between coats.

B. Verify that preparatory work is complete prior to installation of air membrane material.

C. After the transition membrane is installed, spray a complete and continuous unbroken film of air barrier liquid membrane at a wet film thickness of not less than 70 mils for smooth surfaces and 90 mils for rough surfaces. Overlap transition membrane a minimum of 1 inch.

D. Spray around projections and veneer masonry tie anchors to ensure a complete and continuous membrane seal.

3.5 FIELD QUALITY CONTROL

A. The Membrane Air Barrier Manufacturer's Representative will determine during the course of the air barrier work whether the material and the workmanship used in the work actually comply with the requirements of the Contract Documents and the Quality Assurance as specified in this Section.

B. Deficiencies:

1. Where inspections indicate improper installation or other deficiencies in the work, review reports and prepare a recommendation for additional or remedial work to compensate for deficiencies.
2. When directed by the Architect, proceed with additional or remedial work as required to compensate for deficiencies.

C. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

D. Inspections: Air barrier materials, accessories, and installation are subject to inspection for compliance with requirements. Inspections may include the following:

1. Continuity of air barrier system has been achieved throughout the building envelope with no gaps or holes.
2. Continuous structural support of air barrier system has been provided.
3. Masonry and concrete surfaces are smooth, clean, and free of cavities, protrusions, and mortar droppings.

4. Site conditions for application temperature and dryness of substrates have been maintained.
5. Maximum exposure time of materials to UV deterioration has not been exceeded.
6. Surfaces have been primed, if applicable.
7. Laps in transition membranes have complied with minimum requirements and have been shingled in the correct direction (or mastic has been applied on exposed edges), with no fishmouths.
8. Termination mastic has been applied on cut edges.
9. Transition membranes have been firmly adhered to substrate.
10. Compatible materials have been used.
11. Transitions at changes in direction and structural support at gaps have been provided.
12. Connections between assemblies (air barrier and sealants) have complied with requirements for cleanliness, surface preparation and priming, structural support, integrity, and continuity of seal.
13. Penetrations have been sealed.

E. Air barriers will be considered defective if they do not pass inspections.

1. Apply additional air barrier material, according to manufacturer's written instructions, where inspection results indicate insufficient thickness.

3.6 CLEANING

A. Remove trash debris, equipment and excess materials from the building and project site.

B. Remove stains and other air barrier membrane materials from finish building surfaces, walks, paving and landscaped areas of the site. Restore finishes to their original condition.

3.7 PROTECTION

A. Air barrier materials are not designed for permanent exposure. The products designed to withstand jobsite exposure for up to 6 weeks.

B. Cover with finish wall materials within this exposure time or provide temporary protection in accordance with the manufacturer’s printed instructions.

END OF SECTION

SECTION 07 53 23
FULLY ADHERED ELASTOMERIC SHEET ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Fully adhered, Class A fire-rated elastomeric sheet roofing membrane system (EPDM), including but not necessarily limited to providing and installing the following:

1. Class A fire-rated fully adhered roof membrane with tape seams.
2. Roof insulation and insulation fasteners.
3. Insulation crickets, saddles and tapered system.
4. UL Class A fire-rated base flashing.
5. Sheet metal items required for roofing installation.
6. Termination and/or counterflashing assemblies.
7. Associated sealant work.
8. Adhesives, mastics, tapes, cements and sealants for installation of roof membrane and associated construction.
9. Flashing and counterflashing required by roof penetrations of other trades and conditions of the installation including those for mechanical and electrical items and construction.
10. Accessories and materials required for a complete system installation.
11. Roof Membrane Manufacturer's representative on project site inspection.
12. Roof Membrane Manufacturer's written fifteen (15) year (no limits of liability) total system warranty.

B. Related Sections:

1. Rough Carpentry: Section 06 10 00.
2. Sheet metal flashing and trim: Section 07 62 00.
3. Prefabricated roof curbs: Section 07 72 13.
4. Joint sealants: Section 07 92 00.

1.2 PERFORMANCE REQUIREMENTS

A. Wind Uplift Protection:

1. The Roof Membrane Manufacturer prior to bidding and installation is to examine, analyze and review the Drawings and the actual site conditions of the roofing system installation to determine any additional wind uplift protection for all roofs and roof areas of the building for compliance with the herein specified wind uplift criteria and warranty required maximum wind speed.
2. Include costs for additional wind uplift protection beyond the minimum requirements specified herein of the Roof Membrane Manufacturer such as additional membrane and/or insulation securement required as result of the Roof Manufacturer's analysis is to be included in the roof work.

3. The Roof Membrane Installer is to submit to the Owner with the bid and as part the of the required submittals of this Section:

   a. Membrane Manufacturer's wind analysis/review
   b. Written description of all such required additional work.
   c. Written verification that the proposed installation will qualify for the specified manufacturer's standard wind speed warranty.

4. Wind uplift protection criteria as determined by the Roof Membrane Manufacturer used to analyze the roof system is to satisfy applicable codes, specified criteria, manufacturer's warranty requirements and the Owner's insurer requirements.

B. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE/SEI 7.

1. Corner Uplift Pressure: As indicated on the Drawings.
2. Perimeter Uplift Pressure: As indicated on the Drawings.
3. Field-of-Roof Uplift Pressure: As indicated on the Drawings.

C. Factory Mutual:

1. Provide installation of roof insulation and roof membrane on metal concrete decks conforming to, as a minimum, the requirements of FM Class 1-90 for wind uplift.
2. Provide insulation fasteners complying with FM Approval Standard 4470 for corrosion resistance (not more than 10 percent red rust after 30 cycles).

1.3 SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions/specifications for all materials used in the system.

B. Shop Drawings: Submit shop drawings for review prior to approval by the Membrane Manufacturer. Final shop drawing review is required prior to any installation and for final inspection of the warranted roof. Provide shop drawings made by the Roof Membrane Installer or Membrane Manufacturer showing proof of approval by the Roof Membrane Manufacturer on the shop drawings including an assigned project reference number by the Roof Membrane Manufacturer.

1. Provide shop drawings including outline of each roof or roof area, number for reference, showing the location and type of all penetrations, location of and type of seams and keyed locations for all details.
2. Perimeter and all penetration details and special details including methods of attachment, additional membrane securement bars and strips, splices, sizes, spacing and types of all anchors and fasteners.

3. The installer is to supply membrane manufacturer with an as-built shop drawing for final inspection. Provide as-built shop drawings approved by the Roof Membrane Manufacturer.
4. Insulation Crickets, Saddles and Tapered System: Shop drawings showing layout, dimensions, slopes, details and method of attachment to substrate.

C. Wind Design Review: Copies of Roof Membrane Manufacturer's wind design review. This submittal is for information only and will not be reviewed by the Architect but is mandatory submittal requirement of this Section.

D. Installing Contractor's Certification:

1. Roof Contractor's (Installer's) written certification from the Roof Membrane Manufacturer stating that the Roof Contractor is a certified or licensed installer of the roof membrane manufacturer.
2. Experience: Copies of Installing Contractor's recent experience with the selected membrane system.
3. Roofing Contractor's written certification of consecutive exclusive experience with the proposed membrane signed by the Roof Membrane Manufacturer's local representative.

E. Roof Membrane Manufacturer's Installation Certification: Roof Membrane Manufacturer's certification showing compliance with the specified requirements.

F. Roofing Warranty: Submit the total roof system warranty in the form and content (terms) indicated, covering the roofing system and associated work indicated herein, signed by the Roofing Contractor (Installer) and the Roofing System Manufacturer.

1.4 QUALITY ASSURANCE

A. Comply with all laws, ordinances, rules, regulations and orders of public authorities having jurisdiction over this part of the Work.

B. Provide materials and products specified herein for the roof membrane system as the products of one manufacturer to ensure compatibility, uniformity and warranty of the roof system.

C. Materials and Methods:

1. Provide materials and methods of installation in accordance with the current printed published instructions, details and specifications of the Roof Membrane Manufacturer for slopes and type of substrates shown, except as hereafter modified and as approved by the Roof Membrane Manufacturer. In the event of a conflict between these specifications and those of the Membrane Manufacturer, the more stringent or greater is to take precedent and be the one utilized for the installation.
2. All deviations from this Section must be requested in writing to the Architect for approval prior to submittals in accordance with the requirements of Section 01 60 00 - Product Requirements.

D. Installing Contractor Qualifications:

1. The Roofing Contractor (Installer) is to be acceptable to the Roof Membrane manufacturer and the Architect. The Roofing Contractor (Installer) is to also be a certified installer of the specified roof membrane and is to provide written evidence as part of the required submittals.
2. In addition to the above, the Roofing Contractor is to have installed not less than three (3) roofing projects of similar scope or not less than 200,000 square feet of the specified membrane system in the past 18 months. Provide written description of this experience to the Architect.
3. The Roofing Contractor (Installer) is to have not less five (5) consecutive years experience installing the proposed manufacturer's membrane and is to provide written evidence as part of the required submittals.
4. The Roofing Contractor (Installer) is to be capable of responding to the installation site to perform repairs for leaks and other roof system damage within 24 hours from receipt of such notice.

E. Provide a roof membrane manufacturer's representative for inspection of the roofing system during installation and upon completion of the roofing system installation to ascertain that the roofing system has been installed in accordance with the manufacturer's published specifications, details of the roofing system, reviewed shop drawings and this Section.

F. The Roof Membrane Manufacturer is to review the proposed roofing installation and the Contract Document Drawings. Include in the work in addition to that shown on the Drawings and specified herein additional work as required for a complete warranted roofing system.

G. Manufacturer's Certification of Installation: The Roof Membrane Manufacturer, after review of the proposed roofing installation and the Drawings and Specifications, is to submit with the Bid a written certification stating the following:

1. That the proposed installation has been reviewed by the Roofing Manufacturer's technical department, including wind uplift analysis/review
2. List all exceptions and required modifications to the proposed installation and the Contract Documents.
3. That the proposed installation will qualify for the herein specified warranty period and terms when installed in accordance with the Roof Membrane Manufacturer's installation instructions, the Contract Documents and any accepted proposed exceptions or required modifications.
4. Submit certification signed by an officer of the Roof Membrane Manufacturer empowered to sign such certification as specified herein.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original unopened containers and packaging.

B. Provide containers labeled with manufacturer's name, brand name, UL classification, installation instructions and identification of various items.

C. Store materials, except membrane, between 60 degF and 80 degF. If exposed to lower temperature, restore to proper temperature before using.

D. Store materials, except membrane, in dry area and protect. Remove and replace damaged materials at no additional cost to the Owner.

1.6 PROJECT/SITE CONDITIONS

A. Weather Conditions: Proceed with roofing work only when weather conditions are in compliance with manufacturer's recommended limitations, and when conditions will permit the work to proceed in accordance with requirements and the manufacturer's recommendations.

B. Sequencing Protection:

1. Sequence operations to avoid exposure of work on and in the building to the elements.
2. Provide protection from the elements.
3. Provide protection of the existing construction from damage by construction operations. Repair or replace construction so damaged as reviewed by the Architect.

C. Protection:

1. Protect roof areas crossed during work activities and rectify any roofs affected by use activities.
2. Install roofing and insulation during dry weather. Provide necessary protection and temporary covering of adjacent finished work to avoid damage by staining, spillage or otherwise until completion of roofing. Verify that all ducts, piping, cants, drains, vents, curbs, grounds and other penetrations have been properly installed and secured. Given free access to roof areas to work specified in other Sections or any other work necessary to perform concurrently with work under this Section and, when installed, flash or otherwise treated to produce a complete and watertight installation.
3. Provide water cutoffs around all exposed roofing and insulation at end of day's work. Remove cutoffs before starting work next day.

D. Material Conditions:

1. Do not use oil base products or plastic roof cement in connection with elastomeric membrane roofing.
2. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat) or direct steam venting to come in contact with elastomeric membrane roofing system.
3. Do not expose roofing membrane and accessories to a constant temperature in excess of 180 degF.
4. Take precautions in accordance with manufacturer's written recommendations for splice wash and other materials.
5. Provide splicing and bonding surfaces dry and clean.

6. Cold temperatures will not restrict installation of elastomeric roof system. Follow specified precautions for storage of materials and expose only enough cement and adhesive to be used within a 4-hour period.
7. Provide roof surfaces free of ponded water, ice or snow to eliminate future condensation problems.

1.7 WARRANTY

A. The roof membrane manufacturer's representative is to inspect the installation of the roofing membrane system, including insulation, base flashing and associated work of the system and upon approval, a Roof Membrane Manufacturer's fifteen (15) year total system warranty is to be issued.

B. The Roofing Contractor and Roof Membrane Manufacturer are to warrant the roof membrane, base flashing and associated roof work of the total system to be free of faults and defects for a period of fifteen (15) years for watertightness under maximum wind speed and gusts up to 72 miles per hour.

C. The manufacturer's warranty is to be fully paid for by the Roofing Contractor. Provide warranty covering both labor and material, without financial limits, to repair leaks on the roof membrane, base flashing and associated roof work of the total system.

D. Copies of warranty signed by the Roofing Contractor and the Manufacturer and submitted to the Architect.

E. This warranty is in addition to, and not a limitation of other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Roof Membrane:

1. Carlisle Syntec Systems, Division of Carlisle Corporation; Carlisle, PA 17013.
2. Firestone Building Product Company, Division of the Firestone Tire and Rubber Company, Indianapolis, IN 46268.
3. Johns Manville International, Inc., Denver, CO 80217.

2.2 MEMBRANE SYSTEM

A. Fully Adhered, Class A Fire-Rated, EPDM (ethylene propylene diene monomer) sheet roof membrane system over mechanically attached to deck construction polyisocyanurate rigid insulation boards. One of the following:

1. Carlisle, Sure-Seal, Design A, Adhered Roofing System.
2. Firestone, Rubbergard, Adhered Roofing System.

3. Johns Manville, Ultra Gard, Fully Adhered.

B. Roof Membrane: 0.060 inch thick, unreinforced, color black maximum 10 feet x 100 feet or the longest sheet possible as determined by job condition, Class A Fire-Rated, EPDM compounded elastomer conforming to ASTM D 4637 minimum physical properties.

2.3 RELATED SYSTEM MATERIALS

A. Base Flashing: Fire-rated EPDM membrane flashing, 0.060 inches thick, standard of membrane manufacturer.

B. Bonding Adhesive: Compatible with materials to which the membrane is to be bonded, standard of membrane manufacturer.

C. Seam and Splicing Tape: Minimum 0.60 mm thick EPDM based tape, formulated for compatibility with EPDM membrane and high solids primer, furnished by membrane manufacturer.

D. Splice Primer: Compatible with materials with which it is used, furnished by membrane manufacturer.

E. Lap Sealant: Compatible with materials with which it is used, trowel or gun consistency, furnished by membrane manufacturer.

F. Water Cutoff Mastic: Compatible with materials with which it is used, furnished by membrane manufacturer.

G. Molded Pipe Flashing: Compatible with materials with which it is used, furnished by membrane manufacturer.

H. Night Seal: Compatible with materials with which it is used, furnished by membrane manufacturer.

I. Pourable Sealer: Compatible with materials with which it is used, furnished by membrane manufacturer.

J. Securement Strips and Fasteners: Additional securement strips and fasteners furnished by membrane manufacturer when appropriate to system.

K. Roof Insulation: Polyisocyanurate foam core insulation boards with fiberglass facers laminated to both sides, complying with ASTM C 1289, Type II and UL Classified when tested in accordance with UL 1256 and approved for Class 1 insulated steel deck construction when tested to FM 4455 standard. Thickness of insulation board as shown on the Drawings, if not shown, provide a minimum 2-1/2 inch single board thickness. Provide insulation with a minimum aged total, R=5.6 per 1 inch thickness. Provide roof insulation acceptable to the Roof Membrane Manufacturer. One of the following:

1. Carlisle, Polyisocyanurate HP.
2. Firestone, ISO 95.

3. Johns Manville, Ultra Gard Gold.

L. Insulation Crickets, Saddles and Tapered System: Polyisocyanurate foam shaped units with glass fiber reinforced facing on top side. Slopes, heights and sizes of unit as shown on the Drawings, if not shown, provide minimum 1/2 inch vertical per 1 foot horizontal slope for crickets and saddles and minimum 1/4 inch per 1 foot horizontal for tapered system. Provide insulation acceptable to the Roof Membrane Manufacturer. One of the following:

1. Carlisle, Polyisocyanurate HP.
2. Firestone, ISO 95.
3. Johns Manville, Ultra Gard Gold.

M. Preformed Deck Flute Fillers: Polyisocyanurate foam shaped units, factory shaped to fill flutes in the roof deck, minimum 12 inches long.

N. Mechanical Fasteners (Insulation): Self-tapping, corrosion resistant coated screws with rigid thermoplastic polyethylene, or corrosion resistant steel stress plates complying with FM Approval Standard 4470 and FM Class 1-90, as approved by Membrane and Insulation Manufacturer, screw length as required by insulation thickness and the roof membrane manufacturer plus a minimum 3/4 inch penetration into metal deck and corrosion resistant coated screws or concrete spikes of length sufficient to penetrate concrete deck a minimum of 1-1/4 inch, one of the following:

1. Carlisle, Sure-Seal HP Fasteners and Plates.
2. Firestone All Purpose Fasteners and Polymer Insulation Fastener Plate.
3. Johns Manville, Ultra Fast Fasteners and UltraFast Locking Plastic Plates or UltraFast Galvalime Metal Plates.

O. Walkway Pads: Roof membrane manufacturer's standard 30 inch x 30 inch molded black rubber walkway pads with factory rounded corners.

P. Roof Defection Base Flashing Rod Filler: Hollow center, closed cell expanded neoprene rod comply with ASTM D 1056, Type S, Class SC, diameter as shown on the Drawings, if not shown, provide not less than 2 inch diameter.

Q. Preformed Joint Filler (Concrete Paver Edges): ASTM D 1056, expanded closed cell neoprene, Type S, Class SCE 43.

R. Tapered Easement Strips: ASTM C 208, impregnated wood fiberboard, minimum 12 inches wide and same thickness as roof insulation at one end.

S. Prefabricated Curbs: Refer to Section 07 72 13 - Prefabricated Curbs.

T. Metal Cap, Counterflashing, Termination Bars and Sheet Metal Work: Refer to Section 07 62 00 - Sheet Metal Flashing and Trim.

U. Sealants: Refer to Section 07 92 00 - Joint Sealants.

V. Incidental Materials: Roof membrane manufacturer's components and materials required for preparation and installation of membrane and other roof system components.

PART 3 - EXECUTION

3.1 ROOF DECK INSTALLATION

A. Notify the General Contractor in writing of defects in the substrate, and do not proceed until defects have been corrected. If possible, install system starting at the high point of the roof working to the lowest point.

3.2 SUBSTRATE PREPARATION

A. The Roofing Contractor and Membrane Manufacturer's field representative are to examine all surfaces to receive the elastomeric sheet roofing. Application or installation of materials constitutes acceptance of the substrate by the Contractor/Installer of the system and the Membrane Manufacturer.

B. If deteriorated or unsuitable deck is encountered, immediately contact the General Contractor and Architect. If Architect establishes that repairs are required, such work will be performed by others/General Contractor.

C. Do not apply roofing until all vents, drains, curbs, blocking, nailing strips and projections through the roof deck have been installed.

D. Clean substrate of debris and deleterious materials which would impair the work.

E. Do not apply roofing membrane and associated materials in cold or wet weather, unless all requirements of the manufacturer are complied with, and then only in accordance with manufacturer’s instructions and concurrence of the Architect.

F. Install roof membrane materials, insulation board, insulation board fasteners, insulation crickets and saddles, base flashing and associated materials in accordance with current published instructions and specifications of the roof membrane and material manufacturers.

3.3 INSTALLATION OF WOOD BLOCKING AND NAILERS

A. Install wood blocking and nailers in conjunction with roof work as shown on Drawings, as specified herein and as required by the roof membrane manufacturer to locations, configurations and sizes detailed, specified and required.

B. Anchor wood blocking and nailers to deck and other substrates with membrane manufacturer approved hot-dip galvanized fasteners appropriate for the type of materials and methods used in the construction. Anchor nailers to deck in accordance with FM - Loss Prevention Data but not less than maximum of 12 inches o.c. and stagger 6 inches o.c. within 8 feet of corners, to resist a minimum pullout

force of 175 lbs./ft. in any direction on any fastener. Provide 1/2 inch wide vent space between adjacent ends of nailers.

C. Coordinate installation of blocking and nailers with the installation of sheet metal flashing and trim, roof insulation and roof penetrations.

3.4 INSTALLATION OF INSULATION

A. Do not expose insulation to the weather. Install only as much insulation, air barrier and underlayment as can be covered by roof membrane on the same work day.

B. Install roof insulation in courses parallel to the building edges. Stagger end joints of each course a minimum of 6 inches. Provide insulation flush with wood tops of blocking and nailers where required.

C. Mechanically attach insulation and underlayment (OSB) to the metal concrete deck using the herein specified and manufacturer approved fasteners. Provide screw length which penetrates the metal deck a minimum of 3/4 inch. Install roof insulation in two (2) layers, in courses parallel to edges of roof. Stagger end joints of each course staggered a minimum of 6 inches with adjoining courses. Offset all joints of layers not less than 6 inches. Attach insulation and underlayment to metal deck in accordance with the Insulation Manufacturer's requirements but not less than FM 1-90 wind uplift and the following:

1. Field: Minimum seventeen (17) fasteners per 4 foot x 8 foot board, 2.0 square feet per fastener.
2. Corners and Perimeter: Minimum twenty-four (24) fasteners per 4 foot x 8 foot board, 1.3 square feet per fastener.

D. Provide fasteners of sufficient length corresponding to the insulation thickness and the required penetration into the concrete deck. Drill pilot holes for fasteners requiring such.

E. Install insulation boards with joints tightly butted with no joint greater than 1/8 inch in width. Fill joints greater than 1/8 inch in width with slivers of insulation board.

F. Install flute filler pieces where shown in the Drawings or wherever exterior wall insulation meets the underside of the roof deck.

G. Install temporary cutoffs to prevent water or moisture entry. Remove temporary cutoffs prior to resumption of work.

3.5 INSTALLATION OF EASEMENT STRIPS

A. Install tapered fiberboard easement strips at roof drains, 24 inches square. Provide inclines from top of insulation down to drain body. Miter tapered easement strips at corners and attach to deck using not less than two of the herein specified insulation fasteners per each easement strip.

3.6 INSTALLATION OF CRICKETS, SADDLES AND TAPERED SYSTEM

A. Install insulation crickets, saddles and tapered system over base layer of roof insulation. Mechanically fasten crickets, saddles and tapered system insulation to metal deck using here specified and roof membrane and insulation manufacturer approved fasteners. Attach to metal deck to comply with the above specified minimum number of fasteners per size of insulation fabrication.

B. Cover crickets, saddles and tapered system with roof membrane before the end of the work day. Install temporary cutoffs or night seals to prevent water or moisture entry.

3.7 INSTALLATION OF MEMBRANE

A. Determine the direction of water drainage and the low point of the roof. Provide orientation of both end laps and side laps such that the direction of water flow is over the laps. Change direction of the overlap seams to correspond to each change in the direction of water flow across the roof surface.

B. Membrane Placement:

1. Position roofing membrane over approved substrate without stretching.
2. Allow membrane to relax approximately half hour prior to splicing and flashing.
3. Fold back the sheet so that half of the underside of the sheet is exposed and without wrinkles or buckles.
4. Stir bonding adhesive and apply evenly, without globes or puddles. Roll adhesive on both the membrane sheet and the insulation board face using a 9 inch wide plastic core short nap paint roller. Apply adhesive 100 percent to both surfaces at a minimum rate of 60 square feet per gallon of adhesive.
5. Do not apply bonding adhesive to the minimum 3 inch wide sheet splice area between sheets.
6. Allow adhesive to dry until it is tacky but will not string or stick to a dry finger touch.
7. Roll the coated membrane into the coated insulation board avoiding wrinkles.
8. Brush down the bonded half of the sheet immediately after rolling the sheet into the adhesive, with a soft bristle push broom to achieve maximum contact and adhesion of materials.
9. Fold back the unbonded half of the sheet and repeat the same bonding procedure as above.
10. Install adjoining sheets using the same procedure, lapping sheet edges a minimum of 3 inches.

C. Membrane Splicing:

1. Position adjoining sheets lapping edges a minimum of 3 inches. Locate field spices at roof drains outside the drain sump area.
2. Overlap adjacent sheets and mark a line 1/2 inch out from the top sheet.
3. Fold the top sheet back and clean the dry splice area (minimum 2-1/2 inches wide) of both membrane sheets with Sure-Seal Primer as required by the membrane manufacturer.

4. Apply splice tape to bottom sheet with the edge of the release film along the marked line. Press tape onto the sheet using hand pressure. Overlap tape roll ends a minimum of 1 inch.
5. Remove the release film and press the top sheet onto the tape using hand pressure.
6. Roll the seam toward the splice edge with a 2 inch wide steel roller.
7. Lap Seal: When required by the membrane manufacturer, provide the following lap seal on membrane splice edges.

    a. Clean the splice edge, extending at least 1 inch onto top and bottom membranes with splice wash.
    b. Apply bead of lap sealant completely covering the splice edge. Feather the lap sealant with a specially preformed putty knife or trowel. Complete lap sealant application of all splices by the end of each working day.

D. Provide membrane perimeter securement and base flashing at the perimeter of each roof level, roof section, curb and roof penetration.

E. Additional Membrane Securement: When required by conditions of the installation and/or wind uplift design review, provide the following additional membrane securement.

1. Install sheet restraining bars or securement strips at applicable locations, including the entire perimeter of each roof area, any change in roof elevation and at each membrane penetration, in accordance with the roofing system manufacturer's requirements and for compliance with the manufacturer's wind uplift analysis.
2. Install membrane securement strips installed tangent to the horizontal plane of the roof. Bridging or floating of the membrane at closures or flashings is not acceptable.
3. Where use of the restraining or securement strips interferes with the flow of surface water, stop and separate by a 6 inch space, then start installation again.

3.8 INSTALLATION OF BASE FLASHING AND PENETRATION FLASHING

A. Flash perimeter at gravel stop fascias, parapets, walls, around vents, curbs and all other roof penetrations with membrane flashing specified using longest pieces practicable. Install flashing and terminations in accordance with the details shown on the Drawings and the Roof Membrane Manufacturer's approved shop drawing details.

B. Complete splice between flashing and main roof sheets before bonding flashing to vertical surface. Extend splice not less than 3 inches beyond the fasteners which attach the membrane to the horizontal surface.

1. Apply bonding adhesive to both flashing and surface to which it is being bonded at a rate covering approximately 60 square feet of finished surface.
2. After the bonding adhesive has dried to the point where it does not string or stick to a dry finger, roll the flashing into the adhesive. Care must be taken to

assure that the flashing does not bridge where there is any change of direction, such as where the parapet meets the roof deck.

3. Nail installed flashing at top of flashing every 12 inches.

C. Flash all penetrations (pipes and conduits) passing through the membrane.

1. Flash pipe with molded pipe flashing standard with membrane manufacturer.
2. Provide prefabricated pipe or conduit penetration cap and curb assembly for groups of pipes or conduit not appropriate for Membrane Manufacturer's premolded flashing.

D. Roof Defection Compensation at Parapet Walls: Install rod filler at the junction of roof and parapet wall as shown on the Drawings. Do not bond rod filler to membrane or base flashing material, do not allow adhesives in contact with rod filler.

3.9 TEMPORARY CUTOFFS

A. Daily Seal: Care should be exercised to ensure that the water does not flow beneath any completed sections of roof membrane and insulation. Temporarily seal loose edge of membrane with manufacturer's night seal when weather is threatening.

1. Mix the two night seal components thoroughly according to the instructions on the label.
2. Apply the night seal at a rate of 100 linear feet per gallon, 12 inches back from the edge of sheet onto exposed substrate surface. If necessary, use a trowel to spread material in order to achieve complete seal.
3. After embedding membrane in night seal, check for continuous contact. Then weight the edge, providing continuous pressure over the length of the cutoff. The recommended weight for continuous pressure is a 10 foot length of 2-1/2 inch neoprene tubing filled with dry sand.
4. When work is resumed, pull sheet free before continuing installation.

3.10 INSTALLATION OF ROOF DRAIN FLASHING

A. Clean all residues and materials from inside the drain bowl and at the clamping ring.

B. Install tapered 12 inch wide easement strips on all sides of roof drain to provide a smooth transition from roof insulation surface to drain bowl. Adhere membrane to easement strips using bonding adhesive, assuring contact with the top surface of the strip.

C. Extend roof membrane down easements and under clamping rings, seal between membrane and drain bowl base with water cutoff mastic as shown on the Drawings and the manufacturer's standard shop drawings details.

D. Install clamping ring and tighten hold-down bolts uniformly and securely. Install drain strainers for each drain.

3.11 INSTALLATION OF MOLDED WALKWAY PADS

A. Install molded rubber walkway pads as shown on the Drawings.

B. Install walkway pads in accordance with the manufacturer's printed instructions. Install walkways pads allowing a 2 inch space between adjacent edges of pads.

C. Adhere pads to roof membrane with membrane manufacturer's splicing cement.

3.12 SHEET METAL TERMINATION ASSEMBLY

A. Provide and install sheet metal termination assembly and accessories as shown on the Drawings for roof areas under the Work of this Section. Refer to Section 07 62 00 - Sheet Metal Flashing and Trim.

B. Coordinate the installation of counterflashing with the Work of other trades affecting the installation.

3.13 SEALANTS

A. Provide and install sealants and accessories as shown on the Drawings for roof areas under the Work of this Section. Refer to Section 07 92 00 - Joint Sealants.

B. Provide sealant work in conjunction with the roofing, sheet metal and termination assembly work as required to provide a watertight and warranted roof membrane system installation.

C. Coordinate the sealant work with the Work of other trades affecting the installation.

3.14 FIELD QUALITY CONTROL

A. Architect and Roof Membrane Manufacturer's representative will determine during the course of the roofing work whether the material installation and the workmanship used in the work actually comply with the requirements of the Contract Documents.

B. Deficiencies:

1. Where inspections indicate deficiencies in the Work, or non-compliance with this Section, the manufacturer specifications and the reviewed shop drawings, prepare recommendations for additional or remedial work to compensate for deficiencies. Recommendations will be reviewed by the Architect and Roof Membrane Manufacturer's representative prior to proceeding with remedial work.
2. When directed in writing by the Architect and Roof Membrane Manufacturer, proceed with additional or remedial work as required to compensate for deficiencies at no additional cost to the Owner.

3.15 CLEANING

A. Remove trash debris, equipment and excess materials from the building and site.

B. Remove stains and other roofing materials from all finish building surfaces, walks, paving and landscaped areas of the site. Restore finishes to their original condition at no additional cost to the Owner.

END OF SECTION

SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

A. Sheet metal flashing and trim, including but not necessarily limited to the following:

1. Termination assembly flashing.
2. Scuppers.
3. Coping.
4. Counterflashing.
5. Miscellaneous items of fabricated aluminum flashing and trim.
6. Inserts, receivers, cleats, anchors, plates, seaming, fasteners, and accessories.
7. Factory applied paint system.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Rough carpentry: Section 06 10 00.
3. Roof membrane: Section 07 53 23.
4. Joint sealants: Section 07 92 00.
5. Painting: Section 09 91 00.

1.2 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies, including cleats, anchors, and fasteners shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual: 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 sheet metal flashing and trim assemblies tested in accordance with ANSI/SPRI/FM 4435/ES-1 and capable of resisting the following design pressure:

1. Design Pressure: As indicated on Drawings.

D. FM Approvals Listing: Manufacture and install Sheet metal flashing and trim assemblies that are listed in FM Approvals' "RoofNav" and approved for windstorm

classification, as indicated on Drawings. Identify materials with name of fabricator and design approved by FM Approvals.

E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient and 180 deg F, material surfaces.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Show details of typical and non-typical conditions, typical formed configurations, seams, joints, thickness and gages of metal, dimensions, types, methods and spacing of anchors for each item shown and required by conditions.

C. Samples:

1. 3 inch x 4 inch pieces of aluminum with standard color selected by Architect.
2. Paint system manufacturer's standard color selection charts.

1.5 INFORMATIONAL SUBMITTALS

A. Certification: Statement that metal complies with reference standards.

B. Warranty: Signed copies for paint finish.

1.6 QUALITY ASSURANCE

A. Provide sheet metal flashing and trim conforming with the following:

1. Recommended practices contained in:
   a. Sheet Metal and Air Conditioning Contractors National Association, Inc., "Architectural Sheet Metal Manual" (SMACNA).

b. The Aluminum Association "Aluminum Construction Manual" and "Specifications for Aluminum Sheet Metal Work in Building Construction".

2. Specified requirements of the manufacturer of the metal.
3. Provide welding complying with American Welding Society Structural Welding Code for Aluminum, AWS D1.2.

B. Installer Qualifications: Engage an experienced Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this project, with a record of successful in-service performance as evidenced by not less than five consecutive years of experience in sheet metal flashing and trim fabrication and installation.

1.7 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. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

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.

1.8 WARRANTY

A. Provide Paint Finish Manufacturer's written warranty stating that the paint finish used on sheet metal fabrications will be free from chipping, peeling, cracking, fading or blistering for a period of 20 years.

B. Provide warranty signed by the Sheet Metal Fabricator and Paint Finish Manufacturer and Applicator (if separate from fabricator).

C. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Sheet and Plate: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required. Provide thicknesses conforming with Table 1, Non-Residential requirements of the Aluminum Construction Manual, minimum 0.032 inch thickness unless otherwise indicated. Provide sheet with mill finish, unless otherwise indicated.

B. Stainless Steel Sheet: ASTM A240/A240M, UNS S30400, dead soft, fully annealed; with smooth, flat surface.

1. Finish: ASTM A480/A480M, No. 2D (dull, cold rolled unless otherwise indicated No. 4 (polished directional satin).

    a. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
    b. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

        1) Run grain of directional finishes with long dimension of each piece.
        2) When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

C. Screws, Bolts and Nuts: ASTM B 221, Alloy 6061-T6.

D. Cleats: 2 inches wide, 3 inches long and continuous pieces of sheet metal; same thickness as flashing or fabrication, unless otherwise indicated.

E. Rivets: ASTM B 221, Alloy 1100-H14, 0.187 inch minimum shank diameter.

F. Nails: Aluminum, ASTM B 221, Alloy 6061 or 5056, conforming with FS FF-N-105B, Type 2, Style 20.

G. Fasteners: 300 Series stainless steel:

1. Concealed: Hex head, self-drill screws.
2. Exposed: Hex head, self-drilling screws with aluminum backed neoprene washers for exterior applications; color coated to match adjoining metal, where exposed to view.
3. Furnish bolts, nuts, screws, clips, washers and other fasteners and accessories necessary to secure and assemble fabrications.

H. Bituminous Paint: Asphalt emulsion, ASTM D 1187 Type A.

I. Joint Sealant: Refer to Section 07 92 00 – Joint Sealants.

J. Solder for Stainless Steel: ASTM B32, with acid flux of type recommended by stainless steel sheet manufacturer.

2.2 FABRICATION - GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.

3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. 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 to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

E. Flashing Receivers: Fabricate from the following materials:

1. Aluminum: 0.032 inch thick.
2. Stainless Steel: 0.016 inch thick.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Make seams in direction of flow.

1. Provide standing seams not less than 1 inch high unless otherwise specified.
2. Flat Lock Seams, Unwelded: Finish not less than 3/4 inch wide.
3. Lap Seams, Welded: Finish not less than 1 inch wide.
4. Lap Seams, Unwelded: Overlap 3 inches unless otherwise noted.
5. Loose Lock Seams, Unsoldered: 3 inches common or hook, seam, filled with sealant.

I. Do not use graphite pencils to mark metal surfaces.

2.3 FABRICATION - TERMINATION ASSEMBLY

A. Fabricate roof membrane termination assemblies as shown on the Drawings at vertical terminations of roof membrane base flashing. Fabricate assembly components in 8 feet to 10 feet lengths.

B. Form termination assembly of minimum 0.051 inch thick sheet aluminum.

1. If not shown on Drawings fabricate termination a minimum of 4-1/2 inches in height with top edge bent outward 1/2 inch at 45 degrees to form a receptor for sealant.
2. Provide a flat area below sealant receptor edge for pressure bar installation.
3. Crease surface longitudinally to produce a spring action that will hold bottom edge against base flashing.
4. Form bottom portion of termination with drip edge at the bottom. Turn back front edge under or over itself forming a continuous hem on the top and bottom edges.
5. Provide fabricated inside and outside units with minimum 1 foot long legs.

C. Provide solid pressure bars 1 inch high and 1/8 inch thick, drill holes 12 inches on center for anchors starting 1 inch from ends.

2.4 FABRICATION - SCUPPERS

A. Fabricate scuppers as shown on the Drawings with welded seams and minimum 4 inch deep flange extensions for extension onto roof membrane and at side and top edges.

1. Aluminum: 0.032 inch thick.

B. Provide removable basket type strainer in outlet tubes formed of minimum 0.032 inch thick aluminum wire. Fasten gravel guard angles to base of scupper.

C. Water test each scupper in the shop before installation into the construction.

2.5 FABRICATION - COPING

A. Fabricate coping to sizes and profiles shown on the Drawings, using 8 feet to 10 feet long sheets. Provide sloping top surface as shown on the Drawings, if not shown, provide not less than 1 inch slope from front to back of coping unit.

1. Aluminum: 0.040 inch thick.
2. Stainless Steel: 0.019 inch thick.

B. Fabricate corner and tee units with fully welded seams and 2 foot long legs. Field fabricated corner and tee units not acceptable for welded units.

C. Form units with 45 degree drip edges and minimum 3/4 inch hems to receive cleats. Provide cleats for installation fabricated from the same material and thickness as for coping.

D. Provide 6 inch wide concealed joint splice cover plates the same shape as coping soldered or welded to underside of one sheet to form a concealed butt seam. Fabricate from same material and thickness as for coping.

E. Provide 1 inch x 1 inch x 0.032 inch thick aluminum angle stiffeners epoxy adhesive bonded to the underside of coping fabrications that exceed 12 inches in depth.

Place stiffener angles 4 inches from the ends of coping unit and spaced not more 18 inches on center for the length of the coping unit.

2.6 FABRICATION - COUNTERFLASHING

A. Form counterflashing as shown on the Drawings or thicker if required by conditions. Fabricate 4 inches in height, turn back front edge under itself forming a hem and back outward 45 degrees to form a continuous drip edge. Form and crease to produce a spring action that will hold bottom edge against vertical surface. Provide fabricated inside and outside corner unit with minimum 1 foot long legs.

1. Aluminum: 0.051 inch thick.
2. Stainless Steel: 0.019 inch thick.

B. Fabricate built-in receiver to accept counterflashing by means of friction or snap-in securement. Provide two-piece assembly to allow for removal and replacement of counterflashing without damage to components or other construction.

C. Form counterflashing units in 8 foot to 10 foot lengths. Joint units with hook seams.

2.7 FINISH OF ALUMINUM

A. Provide exposed sheet metal free of scratches and serious blemishes affecting the finish system.

B. High Performance Organic Coating Finish: Apply coil coating process on sheet aluminum before fabrication as recommended by coating manufacturer and applicator.

C. 2-Coat Fluoropolymer Coating System: AAMA 2605. Containing not less than 70 percent PVDF resin by weight.

D. Color selection will be made by the Architect from standard colors with a maximum of one color being utilized for sheet metal fabrications, trim and accessories.

E. Provide the specified coating system on fabrications exposed to view, indicated or noted on the Drawings as prefinished.

F. Provide protective removable film to protect paint finish during fabrication, shipping and installation.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

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

3.2 UNDERLAYMENT INSTALLATION

A. Felt Underlayment: Install felt underlayment, wrinkle free, using adhesive to minimize use of mechanical fasteners under sheet metal flashing and trim. Apply in shingle fashion to shed water, with lapped joints of not less than 2 inches.

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

C. Apply slip sheet, wrinkle free, over underlayment or directly on substrate before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
5. Torch cutting of sheet metal flashing and trim is not permitted.
6. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.

1. Coat concealed side of aluminum sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws or for other substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

F. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Section 07 92 00 Joint Sealants.

G. 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 use torches for soldering.
3. Heat surfaces to receive solder, and flow solder into joint.

    a. Fill joint completely.
    b. Completely remove flux and spatter from exposed surfaces.

4. Stainless Steel Soldering:

    a. Tin edges of uncoated sheets, using solder for stainless steel and acid flux.
    b. Promptly remove acid-flux residue from metal after tinning and soldering.
    c. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.4 INSTALLATION - TERMINATION ASSEMBLY

A. Install termination flashing lapping joints 3 inches. Install pressure bars over top portion of termination assembly with end joints tightly butted and staggered over counterflashing joints. Anchor assembly to substrate with stainless steel or cadmium plated steel anchors with backed compression type neoprene washer. Provide anchors of sufficient size, length and type as required by construction conditions to secure the assembly, compatible with substrate materials.

B. Install pressure bars over termination assembly, offset joints on sheet metal and termination bar not more than 4 inches and anchor to substrate 12 inches on center for anchors starting 1 inch from ends.

3.5 INSTALLATION - SCUPPERS

A. Provide scuppers through gravel stop/fascia as shown on Drawings. Extend roof flanges 4 inches onto roof and wood edge blocking.

B. Secure each flange with not less than 4 nails and fold flange edge back over nail heads.

3.6 INSTALLATION - COPING

A. Assemble and anchor coping components to the construction to allow for expansion and contraction, maintaining a weathertight condition.

B. Install and anchor coping units without the use of exposed fasteners. Install units straight, plumb, level and in proper alignment with other work.

C. Retain coping units with 4 inch long cleats specified, spaced not more than 24 inches o.c. on backside and continuous on front or building face. Secure one end

with two nails and fold clip back over nail heads. Lock free end of cleat into seam or into folded edge of sheet metal.

D. Install flush butted concealed splice joint covers anchored to one side only to allow for expansion and contraction of assemblies.

E. Fill concealed butt joints and other joints of the coping assembly with sealant.

3.7 INSTALLATION – COUNTERFLASHING

A. Provide counterflashing on vertical masonry walls and other surfaces as shown on the Drawings at termination of roof membrane base flashing and as counterflashing for clay roofing tile.

B. Build receiver of two-piece counterflashing assembly into masonry walls. Install counterflashing in receiver after installation of roof membrane or clay roofing tile.

3.8 ERECTION TOLERANCES

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

3.9 CLEANING AND PROTECTION

A. Remove scraps and dirt immediately upon completion of work.

B. Clean fabrications of surface dirt, oils, grease, weld or solder residue and other surface contaminates that would effect the application of finish primers and paints.

C. After installation cover and protect exposed portions of the fabrications from damage.

D. Just prior to final acceptance, remove protective coverings and clean surfaces with plain water, or if required with a solution of water and mild household detergent as recommended by manufacturer of finish coating system.

E. Touch-up finish coat system of imperfection as recommended by manufacturer of finish coating system. Remove and replace any component that cannot be successfully repaired.

END OF SECTION

SECTION 07 72 13
MANUFACTURED ROOF CURBS AND PENETRATION ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Manufactured roof curbs, equipment supports, and penetration cover assemblies, including accessories for fabrication and installation.

B. Related Sections:

1. Rough Carpentry: Section 06 10 00.
2. Fully adhered Elastomeric Sheet Roofing: Section 07 53 23.
3. Sheet Metal Flashing and Trim: Section 07 62 00.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Plans, elevations and details and dimensions of construction on each curb and roof penetration assembly. Indicate conditions and related construction. Indicate method of attaching roof accessories to roof or building structure.

1. Describe anchors, fasteners and or welds.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

1.4 QUALITY ASSURANCE

A. Provide welding complying with American Welding Society Structural Welding Code for Steel, AWS D1.1.

B. Provide sheet metal fabrications complying with the applicable portions of the Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA), current edition.

1.5 COORDINATION

A. Coordinate layout and installation of roof curbs and penetration assemblies with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Pate Manufacturing Co.; Broadview, IL 60153.

B. Thybar Corporation; Addison, IL 60101.

C. Roof Products and Systems (RPS), Grand Rapids, MI 49512.

2.2 ITEMS

A. Prefabricated Roof Curbs: One of the following, with liner where so indicated:

1. "Style PC-2" (Pate).
2. "Model TC-3" (Thybar).
3. "Model RC-2A" (RPS).

B. Prefabricated Equipment Supports: One of the following with 18 gage galvanized sheet metal cap and 2 inch x 4 inch treated wood nailer:

1. "Style ES-2" (Pate).
2. "Model TEMS-3" (Thybar).
3. "Model ER-3A" (RPS).

C. Pipe and Conduit Penetration Cover Assemblies: One of the following with EPDM compression seals and stainless steel draw bands and clamping rings:

1. "PCC 1-05" (Pate).
2. "Model TC-1" (Thybar).
3. "Pipe Portal Flashing System" (RPS).

2.3 FABRICATION

A. Prefabricated Curbs:

1. Prefabricate curbs of 18-gage galvanized steel, ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating welded construction. Fabricate units to sizes and heights as shown on the Drawings (if not shown, minimum 12 inches high above roof insulation.)
2. Fabricate curbs with corners joined by continuous welds. Internally reinforce curbs, factory-insulate with 1-1/2 inch thick 3-pound density fiberglass

insulation, and have factory-installed continuous treated wood nailers anchored from underside with TEK screws.

3. Fabricate curbs with tops level, with pitch built into bottom of curb when deck slopes 1/4 inch per foot or greater unless shown or required otherwise. Field verify roof opening sizes, locations, roof slopes and conditions prior to fabrication and submittal of shop drawings.

B. Prefabricated Equipment Supports:

1. Prefabricate equipment supports of 18 gage galvanized steel, ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating reinforced with internal bulkheads of welded construction. Fabricate units to lengths and heights as shown on the Drawings, if not shown, minimum 12 inches high above roof insulation and 6 inches longer than equipment being supported.
2. Fabricate supports with corners joined by continuous welds. Supply supports with continuous treated wood nailer anchored to support with TEK screws. Provide 18 gage galvanized steel, welded cap/counterflashing.
3. Fabricate supports with tops level with pitch built into equipment support bottom when roof deck slopes 1/4 inch per foot or greater unless shown or required otherwise. Field verify support lengths, locations, roof slopes and conditions prior to fabrication and submittal of shop drawings.

C. Roof Penetration Assemblies:

1. Provide prefabricated assemblies consisting of minimum 20-gage galvanized sheet steel ASTM A 653, Grade 40, Structural Steel (SS), galvanized in accordance with ASTM A 924, Class G90 zinc coating. curb cover, EPDM (ethylene propylene diene monomer) compression seals fitted to curb cover and stainless steel clamping rings.
2. Fabricate roof penetration assemblies to maintain watertight conditions at roof penetrations.
3. Field verify roof penetration locations, conditions, and curb sizes prior to fabrication and submittal of shop Drawings.

2.4 FASTENERS

A. Unless otherwise indicated on the Drawings, provide anchors and fasteners as recommended by the manufacturer for the sizes and types of fabrications provided for each condition and type of installation.

B. Furnish bolts, nuts, screws, clips, washers, welding materials and other fasteners and accessories necessary to secure and assemble the specified fabrications.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the roof curbs, equipment supports, and accessories. Verify dimensions of in-place and subsequent construction. Installation of the roof curbs, expansion joint curbs, equipment supports, and accessories constitutes acceptance of the related construction.

3.2 INSTALLATION

A. Coordination:

1. Coordinate locations and sizes of vents, fans, equipment, duct, pipe and conduit penetrations into the roof with mechanical and electrical contractors.
2. Coordinate locations and sizes of fire, smoke and explosion relief vents, and skylights as shown on the Drawings for those items requiring curbs.

B. Install roof curbs and accessories as shown on the Drawings and the reviewed shop drawings. Anchor in accordance with the manufacturer's printed installation instructions for the conditions and types of substrate present.

END OF SECTION

SECTION 07 92 00
JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Joint sealants and installation accessories, including the following:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Installation accessories and materials for the above.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Sheet metal flashing and trim: Section 07 62 00.
4. Hollow metal doors and frames: Section 08 11 13.
5. Aluminum storefronts and entrances: Section 08 41 13.
6. Glazing: Section 08 80 00.
7. Aluminum louvers: Section 08 91 00.
8. Gypsum board: Section 09 29 00.

1.2 PRECONSTRUCTION TESTING

A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.
3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with stone or masonry substrates.
4. Submit not fewer than 8 pieces of each kind of material, including joint substrates, shims, joint sealant backings, secondary seals, and miscellaneous materials.
5. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
6. For materials failing tests, obtain joint sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
7. Testing will not be required if joint sealant manufacturers submit data that are based on previous testing, not older than 24 months, of sealant products

for adhesion to, staining of, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field Adhesion Testing: Before installing sealants, field test their adhesion to project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each kind of sealant and joint substrate.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint sealant manufacturer's technical representative present.
      a. Test Method: Test joint sealants according to ASTM C 1193, Appendix X1, Method A - Field-Applied Sealant Joint Hand Pull Tab, or ASTM C 1521, Method A - Tail Procedure.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint Sealant Schedule: Include the following information:

   1. Joint sealant application, joint location, and designation.
   2. Joint sealant manufacturer and product name.
   3. Joint sealant formulation.
   4. Joint sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. 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.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Laboratory Reports: 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 needed for adhesion.

F. 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.

G. Field Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Comply with the applicable portions of ASTM C 1193 - Standard Guide for Use of Joint Sealants for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Installer Qualifications: An experienced installer who has specialized in installing joint sealants similar in material, design, and extent to those indicated for this Project and whose work has resulted in joint sealant installations with a record of successful in-service performance.

C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

D. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and

cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which 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: 5 years from date of Substantial Completion.

B. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural 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.

C. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40CFR59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Stain Test Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

D. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 JOINT SEALANTS

A. S-2: Single Component, Nonsag Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "Dynatrol I-XL" (Pecora Corporation).
2. "Sikaflex - 1a" (Sika Corporation, Construction Products Division).
3. "Dymonic 100" (Tremco Incorporated).
4. "Masterseal NP1" (Master Builders Solutions).

B. S-3: Multicomponent, Nonsag Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 25, for Use T. Subject to compliance with requirements, provide one of the following:

1. "Dynatred" (Pecora Corporation).
2. "Sikaflex - 2c NS" (Sika Corporation, Construction Products Division).
3. "Masterseal NP2" (Master Builders Solutions).
4. "Dymeric 240FC" (Tremco Incorporated).

C. S-4: Acrylic Latex or Siliconized Acrylic Latex Joint Sealant: ASTM C 834, Type OP, Grade NF. Subject to compliance with requirements, provide one of the following:

1. "AC-20+" (Pecora Corporation).
2. "Tremflex 834" (Tremco Incorporated).
3. "Masterseal 520" (Master Builders Solutions).

D. S-5: Single Component, Nonsag Neutral Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT. Subject to compliance with requirements, provide one of the following:

1. "DOWSIL 790 Silicone Building Sealant" (The Dow Chemical Company).
2. "SilPruf LM SCS2700" (GE Silicones).
3. "Spectrem 1" (Tremco Incorporated).

4. "890NST" (Pecora Corporation).

E. S-6: Single Component, Nonsag Neutral Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50/50, for Use NT and nonstaining to porous substates per ASTM C 1248. Subject to compliance with requirements, provide one of the following:

1. "Spectrem 3" (Tremco, Inc.).
2. "DOWSIL 756 SMS Building Sealant or DOWSIL 795 Silicone Building Sealant" (The Dow Chemical Company).
3. "SilPruf NB SCS9000" (GE Silicones).
4. "864NST", "895NST", or "898NST" (Pecora Corporation).

F. S-9: Butyl sealant: material with a movement capability of plus or minus 5 percent, conforming to ASTM C 1085.

1. "Butyl Rubber Sealant BC-158" (Pecora Corp.).
2. "PTI 757" (H. B. Fuller Company).
3. "Tremco Butyl Sealant" (Tremco, Inc.).

G. S-10: Polyurea Joint Sealant: Two-part, fast setting, self-leveling, 100 percent solids, semi-rigid, for sealing parking garage floor slab, saw-cut, construction and control joints:

1. "Euco QWIK Joint 200" (Euclid).
2. "Masterseal CR 100" (Master Builders Solutions).

2.3 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, and primers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, type and material as recommended and approved in writing by joint sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.4 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; 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 joint sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint sealant manufacturer's written instructions and the following requirements:

1. Remove 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. Remove laitance and form release agents from concrete.
3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.

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 of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
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 according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile complying with ASTM C 1193, Figure 8A, unless otherwise indicated.
4. Provide flush joint profile complying with ASTM C 1193, Figure 8B.
5. Provide recessed joint configuration of recess depth and at locations complying with ASTM C 1193, Figure 8C.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone Sealant System: Comply with the following requirements:

1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

3.4 FIELD QUALITY CONTROL

A. Field Adhesion Testing: Field test joint sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

   a. Perform 10 tests for the first 1,000 feet of joint length for each kind of sealant and joint substrate.
   b. Perform one test for each 1,000 feet of joint length thereafter or one test per each floor per elevation.

2. Test Method: Test joint sealants according to ASTM C 1193, Appendix X1, Method A - Field-Applied Sealant Joint Hand Pull Tab, or ASTM C 1521, Method A - Tail Procedure.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare

these results to determine if adhesion passes sealant manufacturer's field adhesion hand pull test criteria.

4. Record test results in a field adhesion test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 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.

3.6 PROTECTION

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

3.7 JOINT SEALANT SCHEDULE

A. Joints in curtain wall construction S-5

B. Joints in exterior traffic surfaces S-2, S-3 and S-5

C. Joints in exterior vertical surfaces and horizontal nontraffic surfaces (nonstaining for stone and cementitious) S-2, S-3 and S-6

D. Joints in interior traffic surfaces S-10

E. Joints in interior, moving construction, including door frames and tops of interior walls and partitions S-2, S-3 and S-5

F. Joints exposed in non-moving interior construction S-4

G. Joints concealed non-moving interior construction S-9

END OF SECTION

SECTION 07 95 13
EXPANSION JOINT COVER ASSEMBLIES

PART 1 - GENERAL

1.1 SUMMARY

A. Exterior expansion joint cover assemblies including assembly and installation accessories required to complete each installation.

B. Related Sections:

1. Cast-In-Place Concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Roofing: Section 07 53 13.
4. Aluminum storefront and entrances: Section 08 41 13.
5. Gypsum board: Section 09 29 00.

1.2 PERFORMANCE REQUIREMENTS

A. Expansion Joint Design Criteria:

1. Type of Movement: Thermal and Wind sway.

a. Nominal Joint Width: As indicated on Drawings.
b. Minimum Joint Width: As indicated on Drawings.
c. Maximum Joint Width: As indicated on Drawings.

2. Type of Movement: Seismic.

a. Joint Movement: As indicated on Drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, and attachment details.

2. Include details of transitions, splices, intersections, fittings, method of field assembly, block-out requirements, attachments to other work, line diagrams showing entire route of each expansion joint, and location and size of each field splice.
3. Provide isometric drawings of intersections, terminations, changes in joint direction or planes, and transition to other expansion joint systems depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.

C. Expansion Joint Cover Assembly Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion joint cover assembly.
2. Expansion joint cover assembly location cross-referenced to Drawings.
3. Nominal, minimum, and maximum joint width.
4. Movement direction.
5. Materials, colors, and finishes.
6. Product options.
7. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions.

B. Product Test Reports: From a qualified testing agency indicating expansion joint cover assemblies comply with requirements, based on comprehensive testing of current products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain exterior joint systems through one source from a single manufacturer. Coordinate compatibility of joint systems with adjoining materials.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store expansion joint cover assemblies and associated materials in such a manner as to prevent damage or deterioration in accordance with the manufacturer's recommendations. Packaged materials shall be in original containers and wrappings with seals unbroken and labels intact until time of installation. Store materials above ground in a dry place under weatherproof

covers. Damaged or otherwise unsuitable materials shall be immediately removed from the job site.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article are to not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Watson Bowman Acme Corp., Master Builder Solutions USA LLC (WABO), Beachwood, OH 44122.

B. Emseal Joint Systems Ltd., Westborough, MA 01581.

C. MM Systems Corporation, Tucker. GA 30085.

D. Construction Specialties (C/S), Muncy, PA 17756.

E. Balco; a CSW Industrials Company, Wicthita, KS 67217.

F. Johns Manville International, Inc., Denver, CO 80217.

G. Hart & Cooley, Inc. (Portals Plus), Grand Rapids, MI 49512.

2.2 PRODUCTS

A. Exterior:

1. Wall-To-Wall Basis of Design Product, Precompressed foam: "Seismic Colorseal" (Emseal) or comparable products, as approved by Architect of Acceptable Manufacturers. Color to be selected by Architect from manufacturer's standard color selection.
   a. "Seismic Weather Seal" (WABO).
   b. "Series VF" (C/S).
   c. "BCSW" (Balco).
   d. "Seismic Compression Seal" (Nystrom).

2. Roof-to-Wall Basis of Design Product: "RoofJoint 0200" (Emseal) or comparable products, as approved by Architect of Acceptable Manufacturers:
   a. "WABO-Flash, EEJ" (WABO).
   b. "BRJW" (C/S).
   c. "BRBA" (Balco).
3. Roof-to-Roof Basis of Design Product: "RoofJoint" (Emseal) or comparable products, as approved by Architect of Acceptable Manufacturers:
   a. "WABO-Flash, EEJ" (WABO).
   b. "BRJ" (C/S).
   c. "BRB" (Balco).

2.3 MATERIALS

A. Aluminum:

1. Extrusions: ASTM B 221, 6063-T5.
2. Sheet and Plate: ASTM B 209, 6061-T6.
3. Finishes:
   a. Concealed: Mill finish
   b. Exposed to View: Class I, Clear Anodic Finish, complying with AAMA 611.

B. Elastomeric Seals: Manufacturer's standard preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Moisture Barrier: Manufacture's standard flexible elastomeric material, PVC minimum 30 mils thick, EPDM minimum 45 mils thick or Santoprene.

D. Adhesives: As recommended by expansion-joint manufacturer.

E. Mineral-Fiber Blanket: ASTM C665.

F. Bituminous Paint: Asphalt emulsion ASTM D 1187.

G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.4 FABRICATION

A. Furnish units in longest practicable lengths to minimize field splicing.

B. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as necessary to provide continuous horizontal and vertical expansion joint cover assemblies.

C. Factory paint aluminum surfaces which will be in contact with concrete one coat of zinc chromate primer paint.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces and construction to receive the joint cover assemblies and accessories. Verify dimensions of in-place and subsequent construction prior to fabrication.

B. Fabrication or installation of the joint cover assemblies constitutes acceptance of the existing and related conditions and construction. Coordinate locations of assemblies in the construction for work to be accomplished by others required prior to joint assembly installation.

3.2 INSTALLATION

A. Install and anchor joint cover assemblies and accessories in accordance with the manufacturer's printed instruction and the final reviewed Shop Drawings. Make allowance for change in joint size due to difference between installation and construction operating temperatures.

B. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action by factory applied primer paint or a coat of bituminous paint, coatings shall not be exposed to view.

C. Install units straight, plumb, level, and in proper alignment with other work. Use tamperproof fasteners when exposed to view. Flush butt joints of the installation. Adjust cover to freely accommodate joint movement.

D. Install elastomeric seals and membranes in frames with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

E. Maintain continuity of joint systems with a minimum number of end joints and align metal members. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames. Adhere flexible filler materials, if any, to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

F. Water Barrier: Provide water barrier at exterior joints and where called for on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated.

G. Transitions to Other Expansion Joint Cover Assemblies: Coordinate installation of expansion joint cover assemblies including factory-fabricated units to result in watertight performance.

H. Directional Changes: Install factory-fabricated units at directional changes to provide continuous, uninterrupted, and watertight joints.

I. Splices: Splice expansion joints to provide continuous, uninterrupted, and waterproof joints.

J. Install with hairline mitered corners where expansion joint cover assemblies change direction or abut other materials.

K. Terminate exposed ends of expansion joint cover assemblies with field- or factory-fabricated termination devices.

3.3 CLEANING AND PROTECTION

A. After installation, cover and protect exposed portions of the joint cover assemblies from damage.

B. Just prior to final acceptance, remove protective coverings and clean surfaces with plain water, or if required with a solution of water and mild household detergents as recommended by manufacturer. Remove and replace any component that cannot be successfully repaired.

END OF SECTION

SECTION 08 11 13
HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 SUMMARY

A. Hollow metal doors and frames welded, including fabrication and installation accessories.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Finish door hardware: Section 08 71 00.
3. Glazing: Section 08 80 00.
4. Non-Structural Metal Framing: Section 09 22 16.
5. Gypsum board: Section 09 29 00.
6. Painting: Section 09 91 00.

1.2 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.

1.3 ACTION SUBMITTALS

A. Product Data: Copies of manufacturer's data for fabrication and installation instructions.

B. Shop Drawings:

1. Submit shop drawings for the fabrication and installation. Include details of each frame type, elevations of door design types, conditions at openings, details of anchorage to construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
2. Provide a schedule of doors and frames using same reference numbers for details and openings as those on the Drawings. Indicate fire-rated doors and frames, welded and knockdown frames.

1.4 INFORMATIONAL SUBMITTALS

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

B. Certification: When door assemblies required to be fire-rated that exceed manufacturer's capabilities or UL design maximum sizes, submit copies of Door and Frame Manufacturer's Label Certification that each door and frame assembly has been constructed to conform to design, materials and construction equivalent to the requirements for labeled assemblies or products or units tested in accordance with ASTM E 2074.

1.5 QUALITY ASSURANCE

A. Products: Provide custom welded hollow steel doors and frames by a single firm specializing in the production of custom hollow steel work as evidenced by a minimum of 10 consecutive years production experience.

B. Provide custom hollow steel doors and frames conforming to the applicable recommended practices contained in the following:

1. Custom:
   a. National Association of Architectural Metal Manufacturer's (NAAMM) "Hollow Metal Technical and Design Manual", except as hereafter modified.
   b. National Association of Architectural Metal Manufacturers (NAAMM) "Guide Specifications for Commercial Hollow Metal Doors and Frames", ANSI/NAAMM HMMA 861, except as herein modified.

1.6 DELIVERY, STORAGE AND HANDLING

A. Inspection: Inspect hollow metal work upon delivery for damage. Minor damages may be repaired provided the finish items are equal to new work; otherwise, remove and replace damaged items as directed.

B. Storage: Store at the building site under cover. Place units on at least 4 inch high wood sills or on floors in a manner that will prevent rust and damage. Avoid the use of non-vented plastic or canvas shelters, which could create a humidity chamber. If the cardboard wrapper on the door becomes wet, remove the carton immediately. Provide a 1/4 inch space between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Subject to compliance with requirements, provide hollow metal work by one of the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Pioneer Industries, Inc.
4. Republic Doors and Frames.
5. Steelcraft; an Allegion company.

2.2 MATERIALS

A. Hot-Rolled Steel Sheets and Strips: Commercial quality carbon steel, pickled and oiled, complying with ASTM A 1011/ A 1011 M and ASTM A 568/ A 568M.

B. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 1008/ A 1008M and ASTM A 568/ A 568M.

C. Metallic Coated Steel Sheets (Exterior Door Faces, Channels, and Door Frames): ASTM A 653/ A 653M Commercial Steel (CS), Type B, with an A60 zinc-iron-alloy (galvannealed) coating; stretcher leveled standard of flatness.

D. Electrolytic Zinc Coated Steel Sheet: ASTM A 591/ A 591M, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher leveled standard of flatness where used for face sheets.

E. Structural Steel Shapes: ASTM A 36/ A 36M.

F. Steel Bars: ASTM A 108.

G. Steel Plate: ASTM A 283/ A 283M.

H. Supports and Anchors: Fabricate of not less than 0.053 inch thick sheet metal. Galvanized after fabrication for units to be built into exterior walls, complying with ASTM A 1008/ A 1008M or ASTM A 1011/ A 1011M, hot-dip galvanized according to ASTM A 153/ A 153M, Class B.

I. Shop Primer: Modified alkyd rust inhibiting primer paint as standard with door and frame fabricator.

J. Galvanizing Repair Paint: High zinc dust content paint for repairing galvanizing at welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight and complying with SSPC-Paint 20.

K. Galvanized Primer: FS TT-P-641F.

2.3 FABRICATION – GENERAL

A. Fabricate hollow metal units to be rigid, neat in appearance and free from defects, warp, buckle and shadows or surface deformations from welds. Accurately form metal to required sizes and profiles. Wherever practicable, fit and assemble units in the manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at the project site.

Weld exposed joints continuously, grind, dress, and make smooth, flush, and invisible.

B. Prepare hollow metal units to receive finish hardware, including cutouts, reinforcing, drilling, and tapping in accordance with final Finish Hardware Schedule and templates provided by hardware supplier. Comply with applicable requirements of ANSI A115 Specifications for Door and Frame Preparation for Hardware.

C. Locate finish hardware as shown on final shop drawings or, if not shown, in accordance with National Builders' Hardware Association "Recommended Locations for Builder's Hardware".

2.4 DOOR FABRICATION

A. Provide full flush design doors, seamless hollow construction. Bevel both vertical edges 1/8 inch.

B. Fabricate of hot or cold-rolled, stretcher leveled steel sheets. Construct doors with smooth, flush surfaces, continuously welded edge seams without visible joints or seams on exposed faces or stile edges.

C. Reinforce inside with vertical, hot-rolled steel not less than 0.042 inch thick for interior (SDI - Level 2) and 0.053 inch thick for exterior (SDI - Level 3) steel channel shaped sections or interlocking Z-shaped steel sections. Space vertical reinforcing 6 inches o.c. and extend full door height. Spot weld at not more than 5 inches o.c. to both face sheets.

D. Interior Doors: SDI - Level 2 - Heavy Duty, Full Flush and Seamless, but not less than the following:

1. Reinforce tops and bottoms of interior doors with 0.042 inch thick horizontal steel channels spot welded at not more than 5 inches o.c. to the outer sheets.
2. Provide not less than 0.042 inch thick steel faces.
3. Provide sound insulation filler of fiberboard, mineral board or other non-combustible material solidly packed full door height to fill the voids between inner core reinforcing members.
4. Fire Door Core: As required to provide hourly fire and temperature rise ratings indicated.

E. Exterior Doors: SDI - Level 3 - Extra Heavy Duty, Full Flush and Seamless, but not less than the following:

1. Reinforce tops and bottoms of exterior doors with 0.053 inch thick, horizontal galvanized steel channels welded continuously to the outer sheets. Close top edges to provide weather seal, as integral part of door construction or by addition of inverted steel channels.
2. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
3. Provide not less than 0.053 inch thick galvannealed steel face.
4. Insulate doors with door manufacturer's standard fiberglass or mineral fiber insulation core for the full thickness of the door.

F. Reinforce doors with rigid tubular frames where stiles and rails are less than 8 inches wide. Form tubular frames with 0.053 inch thick galvanized steel, welded to outer sheets.

G. Finish Hardware Reinforcement: Unless otherwise indicated herein, reinforce doors for scheduled finish hardware, as follows:

1. Butt Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 6 inches longer than hinge, secured by not less than six spot welds.
2. Continuous Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide continuous, secured by spot welds 8 inches o.c.
3. Mortise Locksets and Dead Bolts: Not less than 0.067 inch thick steel sheet, secured with not less than two spot welds.
4. Cylindrical Locks: Not less than 0.093 inch thick steel sheet, secured with not less than two spot welds.
5. Flush Bolts: Not less than 0.093 inch thick steel sheet, secured with not less than two spot welds.
6. Surface Applied Closers: Not less than 0.093 inch thick steel sheet, secured with not less than six spot welds.
7. Push Plates and Bars: Not less than 0.053 inch thick steel sheet (except when through bolts are shown or specified), secured with not less than two spot welds
8. Surface Panic Devices: 0.067 inch thick sheet steel (except when through bolts are shown or specified), secured with not less than two spot welds.

2.5 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.6 FRAME FABRICATION

A. General:

1. Fabricate frames unless noted otherwise of full welded unit construction, with corners full mitered, reinforced, continuously welded inside the full depth and width of frame miter, including returns, soffits and stops.
2. Knockdown frames will not be acceptable for welded frames.
3. Form frames of either cold or hot-rolled sheet steel.
4. Interior Frames: Provide not less than 0.053 inch thick steel for interior openings, except 0.067 inch for openings exceeding 4 feet wide.
5. Exterior Frames: Provide not less than 0.067 inch thick galvannealed steel for exterior openings, except 0.075 inch for openings exceeding 4 feet wide.

B. Welded Frame Corner Joints (Full Profile Welded) :

1. Fabricate frame members stamped in the flats to a predetermined pattern, designed to provide mitered faces or trims and mitered stops.
2. After fabricating head and jamb members, fit frames together engaging projecting tabs into corresponding slots in the head.

3. Tightly close contact edges so that trim and faces are aligned straight, level and true.
   a. Secure interlocking tabs where they pass thru head slots by welding.
   b. Continuously weld back bends, soffits and returns together.
   c. Continuously weld mitered trim joints on each side inside the frame section. Dress and finish exposed joints to produce invisible connections.
   d. Weld head and jamb together along their intersecting depth and width inside the frame.
   e. Weld jambs to head overhang along the length of each rabbet, inside the frame completely welding the full joint perimeter.
   f. Grind welds on exposed surfaces smooth and flush with adjoining surfaces.

C. Welded Frame Jamb Anchors: Furnish jamb anchors as required to secure frames to adjacent construction and as required by fire-rated assemblies, formed of not less than 0.042 inch thick galvanized steel unless noted otherwise.

1. Masonry Construction: Adjustable, flat or corrugated or perforated, T-shaped to suit frame size with leg not less than 2 inches wide, by 10 inches long. Furnish at least three anchors per jamb up to 7 feet-6 inches height; four anchors up to 8 feet jamb height; one additional anchor for each 24 inches or fraction thereof over 8 feet height.
2. Metal Stud Partitions: Insert type with notched clip to engage metal stud, welded to back of frames. Provide at least four anchors for each jamb for frames up to 7 feet-6 inches in height; five anchors up to 8 feet jamb height; one additional anchor for each 24 inches or fraction thereof over 8 feet height.
3. In-Place Concrete or Masonry: Fabricate frames jambs to accept minimum 3/8 inch diameter concealed bolts into expansion shields or inserts at 6 inches from top and bottom and 26 inches o.c., unless otherwise shown. Reinforce frames at anchor locations. Provide non-removable snap-on covers over anchor bolts, unless otherwise indicated.

D. Floor Anchors: Provide floor anchors for each jamb and mullion which extends to floor, formed of not less than 0.067 inch thick galvanized steel sheet; clip type anchors, with two holes to receive fasteners, welded to bottom of jambs.

E. Structural Reinforcing Members: Provide structural reinforcing members as a part of frame assembly, where indicated at mullions, transoms or other locations which are to be built into frame.

F. Head Reinforcing: For frames over 4 feet wide in masonry wall openings, provide continuous steel channel or angle stiffener, not less than 0.093 inch thick for full width of openings, welded to back of frame at head, except where not allowable for label requirements.

G. Finish Hardware Reinforcement: Unless otherwise indicated herein, reinforce frames for scheduled finish hardware, as follows:

1. Butt Hinges and Pivots: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 6 inches longer than hinge, secured by not less than six spot welds.
2. Continuous Hinges: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x continuous, secured by spot welds 8 inches o.c.
3. Strike Plate Clips: Steel plate not less than 0.187 inch thick x 1-1/2 inches wide x 3 inch long.
4. Surface Applied Closers: Not less than 0.093 inch thick steel sheet, secured with not less than six spot welds.
5. Concealed Closers: Removable steel access plate, not less than 0.093 inch thick internal reinforcement of size and shape required, and enclosing housing to keep closer pocket free of mortar or other materials.

H. Spreader Bars: Provide removable spreader bar across bottom of frames, tack welded to jambs and mullions.

I. Rubber Door Silencers: Drill stop to receive three silencers on single door frames and four silencers on double door frames. Install plastic lugs to keep holes clear during construction.

J. Plaster Guards: Provide 0.016 inch thick steel plaster guards or dust cover boxes, welded to frame, at back of finish hardware cutouts where mortar or other materials might obstruct hardware installation.

2.7 STOPS AND MOLDINGS

A. Provide stops and moldings around openings in hollow metal door and window units and for frames to receive lights where indicated.

B. Form fixed stops and moldings integral with door or frame. Provide fixed stops on outside of hollow metal units exposed to exterior and on corridor side of interior units, unless otherwise indicated.

C. Provide removable stops and molds at other locations, formed of not less than 0.032 inch thick steel sheets. Secure with countersunk machine screws spaced uniformly and not more than 1/2 inch o.c. from corners with butted hairline joints.

D. Coordinate width of rabbet between fixed and removable stops with type of glass or panel and type of installation indicated.

2.8 SHOP PAINTING

A. Clean surfaces of fabricated units of mill scale, rust, oil, grease, dirt and other foreign matter.

B. After fabrication, dress, fill and sand tool marks and surface imperfections as required to make faces and vertical edges smooth, level and free of irregularities.

C. Pretreat cleaned surface in accordance with SSPC-PT-2, SSPC-PT3 or SSPC-PT4. Verify compatibility of primer with galvanized surfaces. Provide primer on galvanized surfaces that will not affect finish paint materials.

D. Shop Applied Paint:

1. Plain Steel: For steel surfaces, use rust inhibitive enamel or paint, either air drying or baking, suitable as a base for finish paints, complying with ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces.
2. Galvanized Steel: Clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified to comply with ASTM A 780. After applying repair paint, clean surfaces and apply galvanized metal primer compatible coatings to be applied over it.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install hollow metal units and accessories in accordance with the final reviewed shop drawings, manufacturer's written instructions, and as herein specified.

B. Setting Masonry Anchorage Devices:

1. Provide masonry anchorage devices where required for securing hollow metal frame to in-place concrete or masonry construction.
2. Set anchorage devices opposite each anchor location in accordance with details on final shop drawings, fire-rated assembly requirements and anchorage device manufacturer's instructions. Leave drilled holes rough, not reamed, and free from dust and debris.

C. Floor Anchors: Floor anchors may be set with power actuated fasteners instead of masonry anchorage devices and machine screws.

D. Placing Frames: Comply with 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 and spreaders leaving surfaces smooth and undamaged.
2. For masonry construction, refer to Section 04 20 00 - Unit Masonry.
3. Install fire-rated frames in accordance with NFPA 80.
4. At in-place concrete or masonry construction, set frames and secure in place with machine screws and masonry anchorage device.
5. Make field splices in frames as detailed on final shop drawing, welded and finished to match factory work.
6. Remove spreader bars only after frames or bucks have been properly set and secured.
7. Installation Tolerances: Adjust hollow metal door 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.

E. Door Installation: Comply with SDI A250.8.

1. Fit hollow metal doors accurately in their respective frames, with the following clearances:
   a. Jambs and Head: 3/32 inch.
   b. Meeting Edges, Pairs of Doors: 1/8 inch.
   c. Bottom: 3/4 inch, where no threshold or carpet (except where scheduled as undercut).
   d. Bottom: At threshold, carpet or thin-set ceramic tile: Not less than 1/4 inch and not greater than 3/8 inch from floor finish or top of threshold.
2. Install fire-rated doors in accordance with NFPA 80.
3. For hardware refer to Section 08 71 00 - Finish Door Hardware.

3.2 ADJUST AND CLEAN

A. Final Adjustment: Check and readjust operating finish hardware items in hollow metal work just prior to final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including doors or frames which are warped, bowed or otherwise unacceptable.

END OF SECTION

SECTION 08 12 17
INTERIOR ALUMINUM FRAMES AND DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Interior aluminum frames for doors.
2. Interior aluminum frames for glazing.
3. Interior aluminum doors.

B. Related Sections:

1. Rough carpentry: Section 06 10 00.
2. Finish hardware: Section 08 71 00.
3. Glazing: Section 08 80 00.

1.2 ACTION SUBMITTALS

A. Product Data: Copies of Manufacturer's data for each type of frame and door specified, including details of construction, materials, dimensions, hardware preparation, profiles, and finishes.

B. Shop Drawings:

1. Submit shop drawings for the fabrication and installation. Include details of each frame type, elevations of frame design types, conditions at openings, details of anchorage to construction, location and installation requirements of finish hardware and reinforcements, and details of joints and connections.
2. Provide a schedule of frames and doors using same reference numbers for details and openings as those on the Drawings.

C. Samples:

1. Manufacturer's standard color and finish selection charts.

1.3 QUALITY ASSURANCE

A. Products: Provide standard extruded aluminum frames and doors by a single firm specializing in the production of extruded aluminum work as evidenced by a minimum of 10 years production experience.

B. Installer Qualifications: Engage an experienced installer who has proven experience in the installation of the type frames and doors specified and who can provide evidence of such experience upon request.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver frame and door components to the project site clearly marked for proper identification. Deliver frames and doors in cardboard boxes or poly-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished frames and doors.

B. Inspect frames and doors on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Raco Interior Products, Inc., Houston, Texas 77055.

B. Western Integrated Materials, Inc., Long Beach, CA 90805.

C. Wilson Partitions, Commerce, CA 90040.

2.2 MANUFACTURED UNITS

A. Frames:

1. "Raco Classic Series" (Raco).
2. "300 Series" (Western Integrated).
3. "Projected Profile" (Wilson).

B. Wide Stile Doors:

1. "550 Series Doors" (Raco).
2. "Wide Stile Doors" (Western Integrated).
3. "Wide Stile Doors" (Wilson).

2.3 MATERIALS

A. Aluminum Extrusions: ASTM B 221, with alloy and temper required to suit structural and finish requirements, and not less than 0.062 inch thick.

B. Trim: Extruded aluminum, not less than 0.062 inch thick; removable, snap-in without exposed fasteners.

C. Fasteners: Aluminum, nonmagnetic, stainless-steel or other noncorrosive metal fasteners compatible with frames, stops, panels, reinforcement plates, hardware, anchors, and other items being fastened.

D. Glazing: As specified in Section 08 80 00 Glazing.

E. Glazing Gaskets: Manufacturer's standard extruded or molded rubber or plastic, to accommodate glazing thickness indicated.

F. Setting Blocks: As specified in Section 08 80 00 Glazing.

G. Door Hardware: As specified in Section 08 71 00 Door Hardware.

2.4 FRAME FABRICATION

A. Fabricate units to produce uniform sight lines and to be level, plumb and in same plane as adjacent panels and members.

B. Provide slotted holes or other acceptable means for erection adjustment.

C. Protect exposed surfaces against damage from scratches and discoloration.

D. Hardware Preparation: Prepare frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of Section 08 71 00 Door Hardware for door and frame preparation for hardware.

1. Reinforce frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.
2. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) - Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames.

E. Glazing Stops:

1. Fabricate with non-removable stops on secure side of doors and windows for glass and other panels.
2. Provide snap-in, removable, glazing beads on inside of glass and other panels in doors.
3. Provide manufacturer's standard vinyl gaskets secured in extruded races integral with fixed and removal stops.

2.1 DOOR FABRICATION

A. Provide door stiles and rails forming the structure of the doors, 1-3/4 inches in depth and tubular in cross section. Join door corners using mechanical clip fasteners and SIGMA deep penetration welds at four weld points per corner.

B. Provide door stile and rail nominal face dimensions as follows:

1. Vertical Stiles: 4-1/2 to 6 inches.
2. Top Rail: 4-1/2 to 6 inches.
3. Bottom Rail: 10 inches.

C. Provide elastomeric extrusions interior glazing gaskets. Provide square type, snap-in door glazing stops without exposed screws providing a minimum of 1/2 inch edge grippage on glass.

D. Prepare and reinforce door for finish hardware items specified in Section 08 71 00 - Finish Door Hardware.

2.2 FINISH OF ALUMINUM

A. Provide exposed surfaces of the frames and doors free of scratches and serious blemishes affecting the finish system.

B. Finish components of frames and doors with manufactures standard oven cured enamel paint meeting or exceeding the requirements of AAMA Specification 2603. Custom color to match Architect's sample.

C. Provide exposed frame and door components free of scratches and serious blemishes affecting the finish system.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine conditions and surfaces of openings and verify dimensions at the site.

B. Install frames and doors in accordance with the manufacturer's printed instructions and the final reviewed shop drawings.

C. Installation of frames and doors and related items constitute acceptance of the existing conditions.

3.2 INSTALLATION

A. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.

B. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels, attach wall anchors to studs with screws.

C. At in-place gypsum board partitions, install slip-on, drywall frames.

D. Doors: Install doors and hardware in accordance with the final reviewed shop drawings and the manufacturer's printed installation instructions. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly and lubricate as recommended by manufacturer.

3.3 CLEANING AND PROTECTION

A. Just prior to final acceptance, remove protective coverings and clean surfaces with plain water, or if required with a solution of water and mild household detergent as recommended by manufacturer of the finish.

B. Touch up finish system of imperfections as recommended by manufacturer of finish system. Remove and replace components that cannot be successfully repaired.

END OF SECTION

SECTION 08 33 23
OVERHEAD COILING DOORS

PART 1 - GENERAL

1.1 SUMMARY

A. Steel overhead, non-fire-rated, coiling doors, motor operated for interior installations.

B. Related Sections:

1. Unit masonry: Section 04 20 00.
2. Metal fabrications: Section 05 50 00.
3. Finish door hardware: Section 08 71 00.
4. Non-structural metal farming: Section 09 22 16.
5. Gypsum board: Section 09 29 00.
6. Painting: Section 09 91 00.
7. Appropriate Division 26 Electrical and Division 28 Electronic Safety and Security Sections.

1.2 PERFORMANCE REQUIREMENTS

A. Operation-Cycle Requirements: Design overhead coiling door components and motor operator to operate for not less than 50,000 cycles for the life of the door.

1. Include tamperproof cycle counter.

1.3 ACTION SUBMITTALS

A. Product Data: For each type and size of overhead coiling door and accessory.

B. Shop Drawings:

1. Plans, elevations, sections, and mounting details of each type of door.
2. Include details of equipment assemblies, and indicate dimensions, required clearances, method of field assembly, components, and location and size of each field connection.
3. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
4. For exterior components, include details of provisions for assembly expansion and contraction and for excluding and draining moisture to the exterior.
5. Include wiring diagrams for motors, controls, and electro/mechanical fusible links.
6. Show and describe anchors and fasteners.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description, recommended installation, operating instructions, and maintenance instructions.

B. Certification: Copies of written certification that doors comply with fire-rating requirements listed herein for fire-rated openings shown on the Drawings.

C. Warranty: Signed copies of the terms stated herein.

1.5 QUALITY ASSURANCE

A. Comply with laws, codes, ordinances, rules and regulations of governmental authorities having jurisdiction over the Work.

B. Accessibility Standard: Comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design and ICC A117.1 2009.

C. Structural Performance, Exterior Door Testing: According to ASTM E 330/E 330M or DASMA 108 for garage doors and complying with acceptance criteria of DASMA 108.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Installer Qualifications: Engage an experienced installer as evidenced by not less than three consecutive years experience installing overhead coiling doors and who is an authorized representative of the overhead coiling door manufacturer for both installation and maintenance of units required for this project.

F. Source Limitations: Obtain overhead coiling doors, operators and controls through one source from a single manufacturer.

1.6 WARRANTY

A. Provide door manufacturer's written warranty stating that the complete overhead door installations and associated equipment will be free of defects in workmanship and materials in accordance with the General Conditions, except the warranty period is to be for 2 years instead of 1 year.

B. Provide warranty signed by the Overhead Door Installer and the Overhead Door Manufacturer. Submit copies to the Architect.

C. The above warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. The Cookson Company, Goodyear, AZ 85338.

B. Cornell LLC, Mountain Top, PA 18707

C. Overhead Door Corporation, Dallas, TX 75380.

D. Wayne-Dalton Doors; Lindenhurst, NY 11757.

2.2 DOORS

A. Non-Fire-Rated Motor Operation:
1. "Model ESD10, Motor Operation" (Cookson).
2. "Model ESD10, Motor Operation" (Cornell).
3. "Model 800 & 900 Service Door, Motor Operation" (Wayne-Dalton).
4. "Series 610, Motor Operation" (Overhead Door).

2.3 FABRICATION

A. Curtain:

1. Steel: Provide curtain consisting of interlocking slats formed from hot-dip galvanized sheet steel conforming with ASTM A 653 and ASTM A 924. Provide a galvanized minimum 1.25 oz. commercial coating. Fabricate from not less than 22 gage steel.
2. Provide flat slats, approximately 2 to 2-1/4 inch x 5/8 to 3/4 inch

B. Bottom Bar: Consisting of two angles, each not less than 1-1/2 by 1-1/2 by 1/8 inch thick; fabricated from manufacturer's standard hot-dip galvanized steel, or aluminum extrusions to match curtain slats and finish.

C. Astragal: Equip each non-motor operated door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

D. Guides: Provide guides consisting of three steel angles, assembled with 3/8 inch diameter bolts to form a groove for the curtain. Provide angles a minimum of 3/16 inch thick. Provide wall angles with slotted holes to receive bolts or lag screws of size and at centers determined by the manufacturer for a secure installation. Provide face-of-wall type mounting, unless shown otherwise on the Drawings.

E. Brackets: Fabricate brackets from steel plate, minimum 1/4 inch thick, designed to house ends of coils.

F. Gears: Provide cast iron gears with teeth cast from machine cut patterns. Provide pinion gears with not less than 3 inch pitch diameter. Design gear ratio for a maximum manual effort of not more than 30 lbs.

G. Counter Balance:

1. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
2. Barrel: Provide barrel of not less than 4 inch diameter steel tubing, designed to limit maximum deflection of 0.03 inch per foot. Provide oil tempered torsion springs capable of correctly counter-balancing the weight of curtain. Provide springs adjusted by means of an exterior wheel.

H. Hood:

1. Fabricate hood from galvanized sheet steel conforming to standards specified for curtain formed to fit the curvature of the brackets and attached securely thereto.
2. Steel: Provide hood construction. Provide 24 gage galvanized sheet metal soffit (finish to match curtain) when hood is mounted above a ceiling.

I. Motor Operation:

1. Provide motor operation, where shown on the Drawings, by means of a high starting torque motor with worm gear type reducer that will raise and lower the curtain at approximately 12 inches per second with thermal overload protection. Provide motor and drive assembly of horsepower and design as determined by the coiling door manufacturer for the size and type of units specified and shown on the Drawings.
2. Provide electronic reversing which will reverse the doors if an obstruction is encountered in either the opening or closing cycle.
3. Provide each coiling door opening with two photoelectric beams located at the jambs that will prevent the doors from closing when either beam is interrupted. Beams is to be active while door is closing.
4. Provide key locked 3-button, push button control stations where shown on Drawings, with push buttons labeled Open, Close, and Stop. Furnish power operation equipment to suit the current characteristics of the electric service supplied.
5. Provide a mechanism for automatically engaging a sprocket and releasing the brake for emergency hand operation from the floor by lifting handles or chain hoist. Include a device to automatically prevent the motor from operating until the emergency sprocket is engaged. Arrange emergency operator to not affect the timing of the limit switch for power operation.

J. Locking Device: Provide two cylinder locks at the bottom of doors (interior side for exterior doors). Cylinder core will be provided by others, refer to Section 08 71 00 - Finish Door Hardware. Provide protective interlock (cutout) switches for motor operated doors.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM/NOMMA 500 for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Doors and Components: Manufacturer's standard baked-on powder-coat finish consisting of prime coat and thermosetting topcoat. Comply with coating manufacturer's written instructions for cleaning, pretreatment, and application. Minimum 2.5 mils cured film thickness; ASTM D-3363 pencil hardness: H or better. Color as selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine surfaces to receive the overhead coiling doors. Verify dimensions of in-place and subsequent construction. Installation of doors constitutes acceptance of the existing conditions.

3.2 INSTALLATION

A. Install overhead coiling doors complete, in accordance with manufacturer's printed instructions and the reviewed shop drawings. Mount doors on face of wall or between jambs as shown on the Drawings and in accordance with the reviewed Shop Drawings.

1. Install according to NFPA 80.

B. Anchoring:

1. The door manufacturer is to determine the locations, quantities, capacity and design for anchors and fasteners used in the installation subject to review by the Architect. Show and describe such anchors and fasteners on the shop drawings submitted to the Architect.
2. Provide anchorage devices and fasteners as required to anchor, secure or attach the coiling doors and guides to the in-place or subsequent construction, including but necessarily limited to bolts, nuts, screws, clips, washers threaded inserts for concrete and masonry, toggle bolts, through bolts, sleeved expansion anchors and other devices required to complete the installation of each coiling door.

C. Electrical Wiring:

1. Verify and coordinate the electrical characteristics of electric devices and controls for the overhead door prior to submittal of Shop Drawings and installation.
2. Provide and install electrical devices, controls and wiring between such, as required for the proper operation of the overhead doors as specified for the types of electrical power available in the building.
3. Provide power wiring and conduit from building sources to the overhead door devices and controls.

D. Upon completion, test operation of doors in the presence of the Owner's representative; make adjustments as required. Instruct Owner's maintenance personnel in the operation and resetting of the fire link devices.

3.3 ADJUSTING AND CLEANING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Clean exposed metal surfaces as recommended by manufacturer

END OF SECTION

SECTION 08 71 00
FINISH DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

A. Finish door hardware for swing, sliding and folding doors.

B. Related Sections:

1. Hollow metal doors and frames: Section 08 11 13.
2. Power Door Operators: Section 08 71 13.
3. Painting: Section 09 91 00.
4. Electronic Safety and Security: Division 28

1.2 ACTION SUBMITTALS

A. Product Data.

B. Samples:

1. Samples for Verification: Submit minimum 2-by-4-inch plate samples of each type of finish required, except primed finish.

C. Hardware Schedule:

1. Provide hardware schedule containing a complete listing of finish hardware items required for the project, whether or not specifically named in the Specifications or indicated on the Drawings. The Architect's review of the schedule is not to be construed to relieve the Contractor of responsibility for errors or omissions in the schedule, nor of the responsibility to completely equip the project with finish hardware.
2. Include in the schedule each door location, hand of door, complete list of each hardware set item per set, finish, manufacturer of each item and keying information. Use same reference numbers and letters for doors and sets as those on the Contract Documents.

D. Keying Schedule: Submit separate detailed keying schedule for approval indicating clearly how the Owner’s final instructions on keying of locks have been fulfilled.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Installation and maintenance instructions and catalog cut sheets for items scheduled.

B. Template Notification: Written notification that required templates and a copy of the final reviewed hardware schedule have been sent to the hollow metal door and frame and aluminum door and frame manufacturers for use in fabrication.

C. Electronic Hardware Systems:

1. Provide complete wiring diagrams for each opening requiring electronic hardware except openings where only magnetic hold-open devices are specified. Provide a copy with each hardware schedule submitted.
2. Provide complete operational (narratives) descriptions of electronic components listed by opening/hardware set in the hardware schedule submittals. Operational descriptions are to detail how each electrical component functions within the opening incorporating conditions of ingress and egress and fire alarm activation or loss of power. Provide a copy with each hardware schedule submitted.

D. Warranties: Copies of warranty for each item requiring a warranty.

E. Operation and Maintenance Manuals: Upon completion, furnish 2 complete maintenance manuals to the Owner. Include the following items:

1. Approved hardware schedule, catalog cuts and keying schedule.
2. Hardware installation and adjustment instructions.
3. Manufacturer's written warranty information.
4. Wiring diagrams and operational descriptions for electronic openings.

1.4 QUALITY ASSURANCE

A. Supplier Qualifications:

1. The hardware supplier is to be an industry recognized company who has maintained and has been furnishing hardware in the project's vicinity for a period of not less than 2 years.
2. The supplier of the finish hardware is to be a firm with not less than 5 years of consecutive experience in supplying finish hardware of the quantity and quantity specified for projects similar in size and complexity.
3. The supplier of the finish hardware is to be a firm technically qualified and experienced in supplying building structures with finish hardware.
4. The supplier is to employ a experienced certified Architectural Hardware Consultant (AHC) who is to be available, at reasonable times during the course of the hardware submittals, supply and installation, for consultation about the project hardware requirements to the Owner, Architect, and Contractor.
5. Refinements such as butt knuckle, clearance, strike lip lengths and adjustments, beveling of lock faces, handing of doors, and centering of backsets will be expected and is to be indicated in the submitted hardware schedule.

B. Supplier Responsibilities: The supplier is responsible for thoroughly detailing the entire project to assure that the items specified will properly function in the indicated locations. Should the items specified not work properly, it is the

responsibility of the supplier to furnish suitable items of comparable quality as approved by the Architect to those being furnished throughout the project.

C. Installer Qualifications: An experienced installer who has completed door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations: Obtain each type and variety of door hardware from a single manufacturer, unless otherwise indicated.

E. Hardware Sets: Contractor is to determine hardware sets based on door function and other information identified in the Drawings.

F. Underwriters' Laboratory Requirements:

1. Furnish hardware in accordance with NFPA Standard No. 80 and 101 for openings specified, shown, or scheduled to receive fire-rated UL labels. In case of conflict between type of hardware specified and type required for fire protection, furnish type required by NFPA and UL.
2. Furnish hardware of type approved by UL for usage with the types and sizes of fire doors and frames required. Unless otherwise shown on the Drawings or specified, arrange fire doors to remain in the normally closed position by furnishing each unit with an automatic closing device. Furnish active latch bolts of UL approved throw.
3. Provide exit hardware for fire-rated openings bearing UL markings.
4. Project requires door assemblies and components that are compliant with positive pressure fire door testing and S-label requirements. Specifications must be cross-referenced and coordinated with flush wood door manufacturers to ensure that total opening engineering is compatible with UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

G. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

H. Regulatory Requirements: Comply with provisions of the following:

1. Accessibility Standard: Where indicated to be accessible, comply with applicable provisions in the USDOJ's "2010 ADA Standards for Accessible Design" and ICC A117.1 2009
2. NFPA 101: Comply with the following for means of egress doors:
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks are not to require the use of a key, tool, or special knowledge for operation.
   b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.
   c. Thresholds: Not more than 1/2 inch high.

I. Reference Standards:

1. ANSI/BHMA A156.

1.5 COORDINATION

A. Coordinate layout and installation of recessed pivots and or closers with floor construction and finishes. Cast anchoring inserts into concrete.

B. Templates: Distribute door hardware templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

C. Keying Conference: Conduct keying conference with the Owner prior to submitting the Key schedule for Owner's review. Incorporate keying conference decisions into final keying schedule including, but not limited to, the following:
1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
2. Final key system schematic diagram.
3. Requirements for key control system.
4. Address for delivery of keys.

D. Electrical System Roughing-in & Installation:

1. Coordinate layout and installation of electrified door hardware with connections to power supplies, fire alarm system and detection devices, access control system, security system and building control system, if any.
2. Prior to installation of electronic hardware, arrange conference between suppliers, installers, and related trades to coordinate materials, procedures, and related work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Handle finish hardware in such a manner as to prevent damage. Store in a clean, dry, secure place.

B. Package each set of hardware items together in sets, identified with set numbers in accordance with the final reviewed hardware schedule.

1. Package each item of hardware separately and labeled separately.
2. Include in each package appropriate fastening installation instructions and templates.
3. Deliver a complete schedule with shipped hardware.

C. Should marking of any item become separated from the item, return the item to the supplier for marking.

D. Immediately remove from the job site damaged or otherwise unsuitable items when so ascertained and replace with an identical item.

1.7 WARRANTY

A. Provide Hardware Manufacturer's standard written form in which the hardware item manufacturer agrees to repair or replace door hardware components that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of operators and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.
2. Warranty Period: 3 years from date of Substantial Completion, except as follows:
   a. Electromagnetic and Delayed-Egress Locks: 5 years from date of Substantial Completion.
   b. Mortise Locksets: 5 years from date of Substantial Completion.
   c. Exit Devices: 3 years from date of Substantial Completion.
   d. Manual Closers: 25 years from date of Substantial Completion.
   e. Overhead Concealed Closers: 2 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS & FINISHES

A. Materials and equipment are contained in the Hardware Schedule.

B. Unless otherwise specified, provide various items of hardware with color and finish matching the finish specified for locksets and latchsets.

C. Provide finishes of the same designation, that come from two or more sources, which match when the items are viewed at arms length and approximately 2 feet apart.

D. Provide hue of color of each finish matching whether or not the base metal is cast, forged or stamped, or when plating is applied over steel, brass or bronze.

E. Provide manufacturer's standard painted finish over bonderized and prime coated metal surfaces where required; the lacquer or enamel matching the finish of the locksets and latchsets unless otherwise specified.

F. Hardware Finishes:

1. Provide finishes as indicated in the herein hardware sets. Provide other hardware with matching finish unless noted otherwise.
2. The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products
3. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

2.2 TEMPLATES

A. Fabricate locks, hinges, closers, and other hardware, to be mounted on hollow metal doors and frames to templates; furnish with machine screws. Furnish templates to hollow metal door and frame manufacturers and other manufacturers requiring such templates.

2.3 FASTENINGS

A. Furnish hardware with screws and other fastenings suitable to assure permanent anchorage. Where exposed, provide fastenings of countersunk oval head type, (except use flat head for hinges), and matching finish of hardware being attached. Provide concealed fastenings. Exposed through and sex bolts are not acceptable. Do not attach hardware with self-tapping or sheet metal screws. Fasten floor type stops and holders to the floor with machine screws into expansion shields.

2.4 ACCEPTABLE MANUFACTURERS

A. Proprietary names used to designate hardware in the schedule are not intended to imply that products of the manufacturer are required to the exclusion of equivalent products of other herein named or listed manufacturers. The Architect is to be informed in writing in accordance with Section 01 60 00 “Product Requirements” for approval of hardware items and manufacturers not specified on the project prior to submitting the hardware schedule.

2.5 ELECTRONIC HARDWARE

A. For each item of electrified hardware specified, provide standard “Molex” type plug connectors to accommodate up to 12 wires. Provide Plug connectors that plug directly into through-door wiring harnesses, frame wiring harnesses, electric locking devices and power supplies.

2.6 HARDWARE ITEMS

A. General: Subject to compliance with requirements, provide hardware as scheduled on drawings, or comparable products approved by Architect.

B. Hanging Devices:

1. Butt Hinges:
   a. Complying with ANSI/BHMA A156.1 Grade 1.
   b. Provide 1 hinge for every 30 inches of door height.
   c. Provide non-removable pins on lockable reverse bevel doors.
   d. Provide butt hinges as manufactured by one of the following:
      1) DormaKaba (DO).
      2) Hager (HA).
      3) Ives (IV).
      4) McKinney (MC).
      5) Stanley (ST).
2. Pivots:
   a. Complying with ANSI/BHMA 156.4 Grade 1.
   b. Provide pivots as manufactured by one of the following:
      1) DormaKaba (DO).
      2) Ives (IV).
      3) Rixson (RX).
3. Continuous Hinges:
   a. Provide heavy duty continuous hinges at exterior aluminum & hollow metal doors.
   b. Provide heavy duty continuous hinges at high-use interior doors where shown.
   c. Provide continuous hinges manufactured by one of the following:
      1) Ives (IV).
      2) Markar (MR).
      3) Pemko (PE).
      4) Stanley (ST).

C. Flush Bolts and Accessories:

1. Provide manual and automatic flush bolts, dust-proof strikes and related accessories as indicated in the hardware schedule sets.
2. Complying with ANSI/BHMA A156.16, Grade 1.
3. Provide with top rod of sufficient length to allow bolt retraction device location at 6 feet above finish floor.
4. Provide items as manufactured by one of the following:
   a. ABH (AB).
   b. Ives (IV).
   c. Rockwood (RO).
   d. Trimco (TR).

D. Cylinders and Keying:

1. Cylinders:
   a. Complying with ANSI/BHMA A156.5, Grade 1.
   b. Manufacturer's standard removable core cylinders and keys of same manufacturer as locksets provided.
      1) Removable core cylinders: 6-pin format with conventional type.
         a) Removable core cylinders finished to match lockset. Removable Cores: Core insert, removable by use of a special key, and for use with only the core manufacturer's cylinder and door hardware.
2. Keying:
   a. Complying with ANSI/BHMA A156.28.
   b. Each type of lock and cylinders to be factory keyed.
   c. Conduct specified "Keying Conference" to define and document keying system instructions and requirements.
   d. Furnish factory cut, nickel-silver large bow permanently inscribed with a visual key control number as directed by Owner.
   e. Owner will determine permanent keying.
3. Key Quantity: Provide the following minimum number of keys:
   a. Change Keys per Cylinder: 2.
   b. Master Keys (per Master Key Level/Group): 5.
   c. Construction Keys (when construction keying is required): 10.
4. Send master keys and key blanks directly from the factory to the Owner in sealed boxes. Submit signed receipt indicating such quantities received and person receiving.

E. Key Registration List (Biting List):

1. Furnish keying transcript list to Owner's representative in the proper format for importing into key control software.
2. Furnish transcript list in electronic file as directed by the Owner.
3. Furnish a list of opening numbers with locking devices, showing cylinder types and quantities required when cylinders or cores are to be owner furnished.

F. Locking Devices:

1. Mortise Locksets:
   a. Complying with ANSI/BHMA 156.13 Series 1000, Grade 1 Certified.
   b. Provide mortise locksets as manufactured by one of the following:
      1) Corbin Russwin (CR).
      2) DormaKaba (DO).
      3) Sargent (SA).
      4) Schlage (SC).
      5) Yale (YA).

G. Magnetic Locks:
1. Complying with ANSI/BHMA 156.23, Grade 1 Certified.
2. Provide magnetic locks as manufactured by one of the following:
   a. DormaKaba (DO).
   b. Securitron (ST).
   c. Schlage (SC).

H. Electrified Locks and Latches:
   1. Complying with ANSI/BHMA 156.13, Grade 1 Certified.
   2. Provide electrified locks and latches as manufactured by one of the following:
      a. Best Lock Corporation (BL).
      b. Schlage (SC).
      c. Sargent (SA).

I. Conventional Exit Devices:

   1. Complying with ANSI/BHMA A156.3 Grade 1 Certified.
   2. Provide exit devices listed by Underwriters Laboratories and bearing the UL label for life safety in full compliance with NFPA 80 and NFPA 101.
   3. Provide lever trim available in finishes and designs to match that of the specified locksets.
   4. Provide conventional exit devices as manufactured by one of the following:
      a. Corbin Russwin (CR).
      b. DormaKaba (DO).
      c. Sargent (SA).
      d. Von Duprin (VO).
      e. Yale (YA).

J. Door Closers - Surface Mounted Door Closers – Heavy Duty:

   1. Complying with ANSI/BHMA 156.4, Grade 1 Certified.
   2. Do not install closers on exterior or corridor side of doors where possible.
   3. Provide surface mounted door closers as manufactured by one of the following:
      a. Corbin Russwin (CR).
      b. DormaKaba (DO).
      c. LCN (LC).
      d. Norton (NO).
      e. Sargent (SA).

K. Door Closers - Concealed Door Closers – Heavy Duty:

   1. Complying with ANSI/BHMA 156.4, Grade 1 Certified.
   2. Provide concealed door closers as manufactured by the following:
      a. Corbin Russwin (CR).
      b. DormaKaba (DO).
      c. LCN (LC).
      d. Norton (NO).
      e. Sargent (SA).

L. Door Trim and Protective Plates:

   1. Complying with ANSI/BHMA A156.6.
   2. Provide kick, mop and armor plates fabricated from 0.050 inch thick stainless steel with beveled edges. Provide heights and widths indicated in the hardware sets.
   3. Push plates, pull plates, door pulls, and miscellaneous door trim to be furnished as specified.
   4. Provide items as manufactured by one of the following:

a. Ives (IV).
b. Rockwood (RO).
c. Trimco (TR).

M. Wall Mounted Door Stops:

1. Complying with ANSI/BHMA A156.16, Grade 1.
2. Provide wall stops for doors unless otherwise indicated.
3. Provide wall stops as manufactured by one of the following:
   a. Ives (IV).
   b. Rockwood (RO).
   c. Trimco (TR).

N. Overhead Stops and Holders:

1. Complying with ANSI/BHMA A156.8, Grade 1
2. Provide overhead holders as manufactured by one of the following:
   a. ABH (AB).
   b. Glynn-Johnson (GJ).
   c. Rixson (RX).
   d. Sargent (SA).

O. Weather-Stripping, Gasketing and Thresholds:

1. Provide items as indicated in the hardware sets.
2. Complying with the following:
   a. Weather-Stripping & Gasketing: ANSI/BHMA A156.22.
   b. Thresholds: ANSI/BHMA A156.21.
3. Provide threshold units that comply with applicable accessibility codes.
4. Provide items as manufactured by one of the following:
   a. Pemko (PE).
   b. Reese (RS).
   c. Zero (ZE).

P. Silencers: Furnish rubber door silencers at hollow metal and/or wood frames; 2 per pair and 3 per single door frame.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine and verify conditions of hardware installations. Installation of finish hardware and related items constitute acceptance of the existing conditions.

3.2 PRE-INSTALLATION ORIENTATION

A. After delivery of hardware and prior to its installation, meet with the installer and manufacturers. Compare approved samples with actual hardware delivered to assure acceptability. Review catalogs, brochures, installation instructions and the

final hardware schedule. Rehearse installation procedures and workmanship, with special techniques of installation.

3.3 INSTALLATION

A. Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

B. Install finish hardware plumb, level and true to line. Install each hardware item in compliance with the manufacturer's printed instructions and recommendations.

C. Install finish hardware using supplied templates for each item. Cut and fit substrate to avoid substrate damage and weakening. Cover cut-outs with hardware item. Mortise work in correct locations and size, without gouging, splintering, or causing irregularities in the finished work.

D. Where cutting and fitting is required on substrates to be painted or stained, install, fit and adjust hardware prior to finishing work. Remove finish hardware and place in original packaging. Reinstall hardware after finishing.

E. Attach thresholds to concrete surfaces using drilled-in lead expansion shields and countersunk flat-head bronze or stainless steel screws. Set thresholds in a continuous bed of polyurethane sealant.

3.4 MOUNTING HEIGHTS OF HARDWARE

A. Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:

1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builders' Hardware for Custom Steel Doors and Frames.
3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Where standards or specified heights conflict, consult the Architect for interpretation prior to mounting hardware.

3.5 FIELD QUALITY CONTROL

A. The Architect and hardware supplier will do a final inspection prior to building completion to ensure that hardware was correctly installed and is in proper working order.

B. Prior to the installation of hardware, manufacturer's representatives for locksets, closers, and exit devices is to arrange and hold a jobsite meeting to instruct the hardware installer's personnel on the proper installation of their respective

products. Send a letter of compliance to the Architect indicating when this meeting is to be held and who will be in attendance.

3.6 CLEANING, TRAINING, AND FINAL ADJUSTMENT

A. Adjust and check each operating item of hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

B. Immediately prior to acceptance of the building by the Owner, lubricate hardware with graphite or special oil, test and adjust moving parts. Clean hardware to remove dust and stains.

C. Instruct Owner's designated personnel in adjustment and maintenance of hardware and finishes during hardware adjustment. Furnish special tools to the Owner's Representative as required to adjust and maintain hardware.

D. Where door hardware is installed more than one month prior to Final Completion or partial occupancy of a space or area, return to the installation during the week prior to Final Completion or partial occupancy and make final check and adjustment of hardware items in such space or area. Clean operating items as necessary to restore to proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment and air movement so that items operate properly.

3.7 PROTECTION

A. Protect exposed hardware installed on doors during the construction phase. Install hardware at the latest possible timeframe to avoid damage from construction activities. Replace damaged hardware.

END OF SECTION

SECTION 08 80 00
GLAZING

PART 1 - GENERAL

1.1 SUMMARY

A. Glass and glazing, including:

1. Glass products.
2. Laminated glass.
3. Insulating glass.
4. Miscellaneous glazing materials.

B. Related Sections:

1. Delegated design requirements: Section 01 13 00.
2. Rough carpentry: Section 06 10 00.
3. Building thermal insulation Section 07 21 00.
4. Joint Sealants: Section 07 92 00.
5. Hollow steel doors and windows: Section 08 11 13.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design glazing, including comprehensive analysis, using performance requirements, design criteria and industry standards indicated herein.
2. The glass manufacturer is responsible for the analysis and engineering of glass and glazing, as well as the fabrication and installation of the glass and glazing.

B. General: Provide glazing systems capable of withstanding normal thermal movement, and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

C. Manufacturer's Engineering Analysis: For glass for exterior openings, the glass manufacturer is to perform wind load and thermal stress analyses and is to demonstrate compliance of glass with performance requirements.

D. Glass Design: Glass thicknesses indicated are minimums and are for detailing only. Confirm glass thicknesses by analyzing project loads and in-service conditions. Provide glass lites for various size openings in nominal thicknesses indicated, but not less than thicknesses and in strengths (annealed or heat treated) required to meet or exceed the following criteria:

1. Glass Thicknesses: Select minimum glass thicknesses to comply with ASTM E 1300, according to the following requirements:

a. Specified Design Wind Loads: As indicated in the Drawings.
b. Impact Loads For Interior Installations: Per applicable code or herein referenced industry standard.

2. Maximum Lateral Deflection: For the following types of glass supported on four edges, provide thickness required that limits center deflection at design wind pressure to 1/50 times the short side length or 1 inch, whichever is less.
   a. For monolithic glass lites heat treated to resist wind loads.
   b. For insulating glass.
   c. For laminated glass lites.
3. Maximum Lateral Deflection (Interior Glazing): Where adjacent to a walking surface, the differential deflection of two adjacent unsupported edges shall be not greater than the thickness of the panels when a force of 50 pounds per linear foot is applied horizontally to one panel at any point up to 42 inches above the walking surface.

E. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss and a temperature change (range) of 120 deg F ambient; 180 deg F, material surfaces.

1.3 ACTION SUBMITTALS

A. Product data.

B. Samples for Verification:

1. 12 inch x 12 inch samples of each type glass.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Literature: Materials description and installation instructions for glazing materials.

B. Design Calculations: Provide design calculations showing conformance with the specified performance requirements prepared and certified by the glass manufacturer.

C. Submit a description of the glass fabricator's proposed heat soak testing program for tempered glass.

D. Wind Load and Thermal Stress Analyses: Copies of manufacturer’s wind load and thermal stress analyses.

E. Compatibility and Adhesion Test Report: Submit copies of statement from sealant manufacturer indicating that glass and glazing materials have been tested for compatibility and adhesion with glazing sealants and interpreting test results

relative to material performance, including recommendations for primers and substrate preparation needed to obtain adhesion.

F. Warranties: Signed copies of warranties.

1.5 QUALITY ASSURANCE

A. Comply with the following:

1. NGA/GANA Publications:
   a. NGA/GANA – Engineering Standards Manual.
   b. NGA/GANA – Laminated Glazing Reference Manual.
2. Glazing Material: FS DD-G-451D and ASTM C 1036.
3. Glass Coating: ASTM C 1376 Standard Specification for Pyrolitic and Vacuum Deposition Coatings on Glass.
4. Safety Glazing: ASTM C 1048, ASTM C 1172, ANSI Z97.1, U.S. Consumer Product Safety Commission Standard 16 CFR 1201 CI and CII, NGA/GANA – Engineering Standards Manual, and NGA/GANA – Laminated Glazing Reference Manual.
5. Insulating Glass:
   a. Manufacturing: ASTM E 2190, Class CBA.
   b. Testing: ASTM E 2190.
   c. Installation: SIGMA TM-3000, Vertical Glazing Guidelines, and SIGMA TB-3001, Sloped Glazing Guidelines.

B. Unless otherwise shown or governed by other referenced standards specified, conform with details and procedures of NGA/GANA – Engineering Standards Manual.

C. Installer Qualifications: An experienced installer, as evidenced by a minimum of 5 years consecutive experience, and who has completed glazing similar in material, design, and extent to that indicated for project and whose work has resulted in construction with a record of successful in-service performance.

D. Source Limitations:

1. Coated Glass: Obtain coated glass from one manufacturer for each type of coating and each type and class of float glass indicated.
2. Insulating Glass: Obtain insulating glass units from one manufacturer using the same type of glass and other components for each type of unit indicated.
3. Laminated Glass: Obtain laminated glass units from one manufacturer using the same type of glass lites and interlayers for each type of unit indicated.
4. Tempered Glass: Obtain tempered glass units from one manufacturer using the same type of glass and tempering process for units.

E. Provide 100 percent heat soak testing of tempered glass as described in Source Quality Control article of Part 2 of this section.

F. In the event of a conflict between specified standards or references the more stringent or greater is to take precedent and be the one utilized for the design and installation.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver glazing materials to project site in manufacturer's unopened containers, fully identified with trade name, color, size, hardness, type, class and grade. Store each item in accordance with manufacturer's instructions. Immediately remove from the job site damaged or otherwise unsuitable material, when so ascertained.

1.7 WARRANTY

A. General Warranty: Special warranties specified in this Article are to not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Insulating Glass Units:

1. Provide insulating glass unit manufacturer's special warranty for the insulating glass units to be free of visual obstruction due to moisture, film formation, or dust collection on the interior glass surfaces.
2. Provide special warranty for 10 years.
3. Provide special warranty signed by the subcontractor and Insulating Glass Manufacturer with copies submitted to the Architect.

C. Coated Glass: Provide a special 10 year warranty from date of manufacture for coated glass. Special warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

D. Laminated Glass: Provide a special 5 year warranty from date of manufacture for laminated glass. Special warranty covers deterioration due to normal conditions of use and not to handling, installing, and cleaning practices contrary to the glass manufacturer’s published instructions.

E. Special warranty shall state that the tempered glass will not experience spontaneous breakage at a rate exceeding 5 lites per 1000. Both material replacement and the labor to install the replacement lite(s) are included in the warranty coverage.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Clear Float Glass: Complying with ASTM C 1036, Type I, Class 1, Quality q3, thickness as determined by the glass manufacturer to comply with the specified performance requirements, tempered in doors and adjacent lights where shown on Drawings or required by codes.

B. Clear Low-Emissivity (Low E) Glass: Complying with ASTM C 1376, thickness as determined by the glass manufacturer to comply with the specified performance

requirements, tempered in doors and adjacent lights and heat strengthened where shown on Drawings or required by codes, one of the following:

1. "Energy Advantage Clear Low E Glass" (Pilkington LOF).
2. "Sungate 300 Clear Low E Glass" (Vitro).
3. "Versalux Clear Low E" (Zeledyne).

C. Ceramic-Coated Vision Glass: ASTM C 1048, Condition B, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Color and Pattern: As selected by Architect from manufacturer's full range.

D. Patterned frit vision glass, silkscreened: glass of indicated type and color that has been heat strengthened and simultaneously processed with a permanent, silkscreened, patterned, fire fused ceramic coating on the No. 2 surface of the glass. Vision glass shall meet requirements of ASTM C 1048, Condition C. Ceramic frit coating shall meet the requirements of GANA Specification No. 95-1-31 and be not less than 0.0015" thick.

1. Custom patterns will be designed by the Architect.
2. Frit shall be custom color selected by the Architect.
3. Silk screen for frit: 200 mesh fabric photographic screen. Hand cut screen will not be acceptable.
4. Glass shall be processed by a method which minimizes visual distortion and eliminates processing marks.

E. Spandrel Glass:

1. Complying with ASTM C 1048, Condition B, Type 1, Quality q3, tempered in doors and adjacent lights where shown on Drawings or required by codes, with ceramic frit on one surface, heat strengthened where specified or required by the glass manufacturer for the conditions of the installation or to comply with specified performance requirements, color selection by Architect from non-standard colors with one being utilized for installations.
2. Provide one of the following:
   a. "Spandrel Glass" (ICD High Performance Coatings, Vancouver, WA 98685).
   b. "Viraspan Ceramic Frit" (Viracon).
   c. "Spandrel Panels" (AGC).
   d. "Spandrel Glass" (Guardian).

F. Clear Laminated Glass: ASTM C 1172, two layers of tempered or heat strengthened clear glass laminated with 0.030 inch thick clear polyvinyl butyral (PVB) interlayer, thickness as determined by the glass manufacturer to comply with the specified performance requirements, where shown on Drawings, provide interlayer by one of the following:

1. "Trosifol" (Kuraray America, Inc.).
2. "Saflex" (Eastman Chemical Company).

G. Glazing Tape: Polyisobutylene/Butyl, complying with ASTM C 1281:

1. Dap, Inc., Butyl Rubber Tape.
2. Pecora Corporation, G-66 or BB-50.
3. Tremco, Tremco 400 Tape.

H. Setting Blocks: Neoprene blocks, 80 to 90 Type A durometer hardness.

I. Spacers: Neoprene blocks, 40 to 50 Type A durometer hardness, 3 inches long, self-adhesive on one face only.

2.2 INSULATING GLASS

A. Provide units manufactured, tested, and approved in accordance with SIGMA requirements.

B. Insulating-Glass Units: Preassemble units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 2190 for Class CBA units and with requirements specified in this Article and in the Glazing Schedule.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) where safety glass is indicated or required by codes.

C. Overall Unit Thickness: Dimensions indicated in the Glazing Schedule are nominal and the overall thickness of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.

D. Sealing System: Dual seal, with primary and secondary sealants as follows:

1. Manufacturer's standard black color sealants.

E. Spacer Specifications: Manufacturer's standard spacer material and construction.

2.3 TEMPERED AND HEAT STRENGTHENED GLASS

A. Provide tempered and heat strengthened glass horizontally heat treated complying with ASTM C 1048. Fabricate tempered and heat strengthened glass units so that roll distortion lines are parallel to the bottom edge of the glass units and the bottom or sill of the glazing pocket into which the glass unit is being installed.

1. Kind HS: Heat strengthened.
2. Kind FT: Fully tempered.

B. Glazing Tape: Closed cell polyvinyl chloride (PVC) foam, fire-rated glazing manufacturer's standard.

C. Setting Blocks: Neoprene, EPDM, or silicone; tested for compatibility with glazing compound; of 70 to 90 Shore A hardness.

D. Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets fire-rated glazing.

E. Logo: Provide each piece of fire-rated glazing labeled with a permanent logo including name of product, manufacture, testing laboratory, fire rating period, safety glazing standards, and date of manufacture.

2.4 GLAZING SEALANTS

A. Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will 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.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Single-Component Neutral and Basic-Curing Silicone Glazing Sealants:
   a. Products:
      1) "DOWSIL 790 Silicone Building Sealant" (The Dow Chemical Company).
      2) "SilPruf LM SCS2700" (GE Silicones).
      3) "SilPruf SCS2000" (GE Silicones).
      4) "Omniseal" (Master Builders Solutions).
   b. Type and Grade: S (single component) and NS (nonsag).
   c. Class: 100/50.
   d. Use Related to Exposure: NT (nontraffic).
   e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
      1) Use O Glazing Substrates: Coated glass.
2. Neutral-Curing Silicone Glazing Sealants:
   a. Products:
      1) "DOWSIL 756 SMS Building Sealant" (The Dow Chemical Company).
      2) "DOWSIL 795 Silicone Building Sealant" (The Dow Chemical Company).
      3) "SilPruf NB SCS9000" (GE Silicones).
      4) "UltraPruf II SCS2900" (GE Silicones).

b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 50.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
1) Use O Glazing Substrates: Coated glass.

3. Class 25 Neutral-Curing Silicone Glazing Sealant:
a. Products:
1) "799" (The Dow Chemical Company).
2) "UltraGlaze SSG4000" (GE Silicones).
3) "Proglaze SSG" (Tremco Incorporated).
b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 25.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: M, G, A, and, as applicable to glazing substrates indicated, O.
1) Use O Glazing Substrates: Coated glass.

2.5 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.

B. Grind smooth and polish exposed glass edges and corners.

2.6 SOURCE QUALITY CONTROL

A. Heat soak testing:

1. Tempered glass shall be subjected to heat soak testing to minimize the occurrence of spontaneous breakage. Each batch shall be tested at 550 deg F plus or minus 50 deg F with a dwell time of 2 hours in accordance with EN 14179.

2.7 GLAZING SCHEDULE

A. Glass Type GL-1 (Vision Units): Minimum 1 inch thick, clear glass insulated units with Low-E coating on surface No. 2. Where safety glass is indicated or required by authorities having jurisdiction, provide type of products indicated which comply with testing requirements in 16 CFR 1201 and ANSI Z97.1, and heat strengthened or tempered to comply with wind load requirements:

1. Outboard Lite: Minimum 1/4 inch clear glass, min. with Low-E coating on surface No. 2.
2. Air Space: 1/2 inch.
3. Inboard Lite: Minimum 1/4 inch clear glass, min.
4. Basis of Design Product: "Sunguard Superneutral 68" as manufactured by Guardian with the following performance characteristics.
a. Transmittance

1) Visible Light: 68 percent
2) Solar Energy: 33 percent
3) Ultra-Violet: 30 percent

b. Reflectance:
1) Visible Light: 11 percent
2) Solar Energy: 12 percent

c. U-Value:
1) Winter Nighttime: 0.29 Btu/(hr x sqft x °F)
2) Summer Daytime: 0.28 Btu/(hr x sqft x °F)

d. Solar Factor (SHGC): 0.38

e. LSG: 1.8

5. Other products of the listed acceptable manufactures having meeting the above performance characteristics will be acceptable subject to review of the manufacturer's published test data and visual and esthetic approval of the Architect.

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine surfaces to receive the parts of the work specified herein. Verify dimensions of in-place and subsequent construction. Application or installation of materials constitutes acceptance of the related construction.

3.2 INSTALLATION - GENERAL

A. Employ only experienced glazers who have had previous experience with the materials and systems being applied. Use tools and equipment recommended by the glass manufacturer.

B. Measure openings and cut glass accurately to fit each opening with minimum edge clearances and bite on glass as specified by NGA/GANA. If glass is to be cut to size at project site deliver each piece to project at least 2 inches larger (in both dimensions) than required, so as to facilitate the cutting of clean cut edges without necessity of seaming or nipping. Do not seam, nip or abrade tempered glass at the job site.

C. Maintain a minimum temperature of 40 deg F during glazing unless the manufacturer of the glazing materials specifically agrees to application of manufacturer's materials at lower temperatures. If job progress or other conditions require glazing work when temperatures are below 40 deg F (or below minimum temperature recommended by the manufacturer), consult the manufacturer and establish the minimum provisions required to ensure satisfactory work. Record in writing to the manufacturer, with copy to the Architect, the conditions under which such glazing work proceeds and the provisions made to ensure satisfactory work.

D. Clean glazing stops and rabbets to receive glazing materials of obstructions and deleterious substances which might impair the work. Remove protective coatings which might fail in adhesion or interfere with bond of sealants. Comply with

manufacturer's instructions for final wiping of surfaces immediately before application of primer and glazing sealants or tapes.

E. Prime surfaces to receive glazing sealants in accordance with manufacturer's recommendations, using recommended primers. Test materials and surfaces for adhesion of sealants.

F. Inspect each piece of glass immediately before installation. Do not install pieces which have significant impact damage at edges, scratches or abrasion of faces or any other evidence or damage.

G. Locate setting blocks at the quarter points of sill but no closer than 6 inches to corners of glass. Use blocks of proper size to support the glass in accordance with manufacturer's recommendations.

H. Provide spacers for glass to separate glass from stops, except where continuous gaskets or tape are required. Locate spacers 36 inches o.c. maximum inside and out, with a minimum of 2 spacers per edge of glass. Provide thickness equal to sealant or compound thickness shown. Provide width as required for minimum of 3/8 inch bite on glass at edges.

I. Set glass in a manner which produces greatest possible degree of uniformity in appearance. Face glass, which has dissimilar faces, with matching faces in the same direction. Set glass with bow (if any) to exterior.

J. Install patterned frit glass lites with pattern continuity between adjacent lites. Misalignment of pattern elements shall not exceed 1/8 inch.

K. Install tempered and heat strengthened glass units with the roll distortion parallel to the bottom or sill glazing pocket in accordance with the glass manufacturer's recommendations for the type of glass installation.

L. Do not use glazing materials from different sources in the same joint system unless the manufacturer of each material has stated in writing that manufacturer’s material is fully compatible with the other material.

M. Use masking tape or other suitable protection to limit coverage of glazing materials to the surfaces intended for sealants.

N. Glazing Tape:

1. Butt or lap ends of sealant tape in accordance with the manufacturer's recommendations.
2. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
3. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
4. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

5. 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.
6. Do not remove release paper from tape until just before each glazing unit is installed.

O. Clean excess sealant from glass and framing members immediately after application, using solvents or cleaners recommended by manufacturers.

3.3 GASKET GLAZING (DRY)

A. Install glass units in curtain walls, windows, doors, sidelites, interior glazing channels and metal framed skylights using curtain wall, glazing channel, window door or skylight manufacturer's standard extruded glazing gaskets and strips installed in accordance with manufacturer's printed installation instructions.

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. 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 by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

3.4 PROTECTION AND CLEANING

A. Protect glass from breakage immediately upon installation. Use streamers or ribbons suitably attached to framing and held free of glass. Do not apply warning markings directly to the glass.

B. Remove and replace glass which is broken, cracked, chipped or damaged in any way and from any source, including weather, vandalism and accidents during the construction period.

C. Maintain glass in a reasonably clean condition during construction so that it will not become stained and will not contribute to the deterioration of glazing materials.

D. Wash and polish glass on both faces just prior to final acceptance. Comply with instructions and recommendations of glass manufacturer and glazing materials manufacturer for cleaning in each case.

END OF SECTION

SECTION 08 91 00
LOUVERS

PART 1 - GENERAL

1.1 SUMMARY

A. Louvers, including the following:

1. Horizontal, Sightproof, Drainable-Blade Louvers.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Sealants for perimeter abutting construction: Section 07 92 00.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design:

1. Design, engineer, fabricate, and install louvers work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections.
2. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

B. Structural Performance: Louvers shall withstand the effects of gravity loads and the indicated wind loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: As indicated in the Drawings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental

effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F, ambient and 180 deg F, material surfaces.

D. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

E. Anchors and Connections:

1. Anchors, connections, and assemblies connecting the louvers and associated fabrications to the supporting construction are shown on the Drawings as suggested locations for the louver manufacturer/installer's information. The louver manufacturer/ installer is responsible for the structural design and placement of the connections and anchors, including connecting hardware, accessories and reinforcing necessary for fabrication, and installation of the louvers and associated fabrications.
2. The louver manufacturer is to notify the Architect in writing prior to the submittal of shop drawings of any changes in the proposed locations of connections and anchors.

1.3 ACTION SUBMITTALS

A. Shop Drawings:

1. Indicate sections of typical members, dimensioned elevations, anchors, and fasteners and their spacing and full details of accessories required.
2. Provide shop drawings with seal and signature of the same engineer who prepares and signs the design calculations.

B. Samples:

1. Copies of paint manufacturer's standard color sample charts of paint system for full range of available colors.
2. 6 inch x 12 inch sample of aluminum with finish specified in color selected by the Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer's Literature: Materials description and installation instructions for louvers.

B. Qualification Data: For Engineer.

C. Design Calculations: Submit calculations prepared by a qualified Engineer, showing compliance with the specified performance criteria. Calculations will not be reviewed by the Architect but are for informational purposes only. Test reports are not an acceptable substitute for design calculations.

D. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

E. Warranty: Signed copies of the following:

1. Louver units.
2. Paint finish.

1.5 QUALITY ASSURANCE

A. Engineer Qualifications: Professional Engineer licensed in the State of Indiana and experienced in providing engineering services of the kind indicated that have resulted in the successful installations, similar in material, design, and extent to that indicated for this Project.

B. Source Limitations: Obtain louvers from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

C. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

D. Governing criteria for louver air performance and water penetration is to be in accordance with AMCA 500 (Air Movement and Control Association, Inc.)

E. Provide factory-applied finish aluminum system in accordance with AAMA 2605 “Superior Performance Organic Coatings on Architectural Extrusions and Panels”.

F. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver louver components to the project site clearly marked for proper identification.

B. Store louver components in accordance with manufacturer's instructions, above ground, in dunnage and protected from weather, construction activities and other causes of damage or loss.

C. Handle materials at the project site in such a manner as to prevent damage. Immediately remove from the project site damaged or otherwise unsuitable material when so ascertained.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify louver openings by field measurements before fabrication and indicate measurements on shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating louvers without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

1.8 WARRANTY

A. Louvers:

1. Provide manufacturer’s written warranty, stating that the louvers will be free of faults and defects for a period of 2 years in accordance with the General Conditions, except the warranty period is to be 2 years instead of 1 year.
2. Provide warranty signed by the Louver Manufacturer and Installing Contractor and submit) copies to the Architect.

B. Paint Finish:

1. Provide manufacturer’s written warranty stating that the paint finish applied on louver components will be free from chipping, peeling, cracking, fading, or blistering in accordance with the General Conditions except the warranty period is to be for 20 years instead of 1 year.

a. Deterioration includes, but is not limited to, the following:
1) Color fading more than 5 Hunter units when tested according to ASTM D 2244.
2) Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
3) Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Provide warranty signed by the Louver Manufacturer and Paint Finish Applicator (if separate from manufacturer) and submit copies to the Architect.

C. The above warranties are in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26, Alloy 319.

D. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use Phillips flat-head screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
4. For fastening stainless steel, use 300 series stainless-steel fasteners.
5. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION - GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal louver blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

C. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: Interior flange unless otherwise indicated.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Provide vertical mullions of type and at spacing indicated, but not more than recommended by manufacturer to comply with performance requirements.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.

F. Access Doors: Provide access doors in louvers where shown on the Drawings, matching louver blade size and configuration, complete with concealed frame and operating hardware, including means for locking.

G. Provide subsills made of same material as louvers for recessed louvers.

H. Join frame members to each other and to fixed louver blades with as standard with louver manufacturer unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 ALUMINUM FINISH

A. Provide louver members and accessories free of scratches and serious blemishes affecting the finish system.

B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and 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.

C. Color and gloss selection will be made by the Architect from non-standard colors with a maximum one (1) color being utilized for the louver units, trim and accessories.

D. Concealed Members: May be mill finish, providing they cannot be seen through the louvers.

E. It is the intention of the specification that the color variation between adjacent parts of the same finish be imperceptible to the naked eye under normal daylight conditions. Pieces abutting or within 6 inches of each other in the construction are not to vary in color by more than half the range so as the variation to be imperceptible to the naked eye under normal daylight conditions. Inspect parts in the shop and grade for assembly compatibility and mark for installation location.

F. Quality Control: Establish and submit for review a quality control program to assure compliance with the specified requirements. Include in the program documented procedures, processes, and other means for quality control. Maintain complete inspection, testing and process records of finishing procedures. Make records available to the Architect upon request. No finishing is to be performed prior to approval of this quality control program.

G. Do not ship any material that has not been inspected, tested and marked as specified, or does not fall within the prescribed color range.

H. Provide protection against galvanic action wherever dissimilar metals are in contact, except in the case of aluminum in contact with galvanized steel, zinc or relatively small areas of stainless steel. Provide protection by painting the dissimilar metal surfaces with a heavy coat of ZRC Zinc primer or by application of an appropriate sealant or tape or other galvanic isolator.

I. Protect aluminum which is to be in contact with cured concrete, mortar or plaster. Apply a heavy coat of bituminous paint applied to the aluminum, or other permanent separator on concealed contact surfaces of the aluminum before assembly or installation.

J. Clean items of carbon steel, unless galvanized or scheduled for other finish, of loose scale, filings, dirt and other foreign matter and paint with zinc rich primer, complying with paint Specification No. 20 of the Steel Structures Painting Council (SSPC). Prepare surface meeting the minimum requirements of SSPC-SP6.

K. Wrap each fabrication with strippable protective plastic sheeting prior to shipping.

2.4 LOUVERS

A. Horizontal, Sightproof, Drainable-Blade Louver:

1. Basis-of-Design Product: Subject to compliance with requirements, provide *"ELF375DX" (Ruskin Company)* or comparable product by one of the following:

    a. Airolite Company, LLC (The).
    b. American Warming and Ventilating, Inc.; a Mestek company.
    c. Construction Specialties, Inc.

2. Louver Depth*:* 4 inches.
3. Frame and Blade Nominal Thickness: Not less than 0.080 for blades and frames.
4. Mullion Type: Concealed.
5. Louver Performance Ratings:

    a. Free Area: Not less than 8.5 sq. ft. for 48-inch- wide by 48-inch high louver.
    b. Point of Beginning Water Penetration: Not less than 870 fpm.
    c. Air Performance: Not more than 0.10-inch wg static pressure drop at 550-fpm free-area velocity.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

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

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

F. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 07 92 00 –Joint Sealants for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Clean exposed surfaces of louvers that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION

SECTION 09 22 16
NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Non-structural metal framing, including the following:

1. Non-load bearing interior light gauge steel studs and furring.
2. Ceiling and soffit suspension systems for interior gypsum board assemblies.
3. Backing plates not provided by other trades for support of items attached to metal framing system.
4. Supplementary parts and components, such as clips, fasteners, supplementary framing, and other miscellaneous accessories required for a complete installation.

B. Related Sections:

1. Delegated Design: Section 01 13 00.
2. Cold-formed steel framing: Section 05 40 00.
3. Rough carpentry: Section 06 10 00.
4. Building thermal insulation: Section 07 21 00.
5. Gypsum board: Section 09 29 00.

1.2 DELEGATED DESIGN PERFORMANCE REQUIREMENTS:

A. Design, engineer, fabricate, assemble and install non-structural metal framing work in compliance with specified standards, performance requirements, material selections and requirements of this and related sections; to satisfy applicable governing codes and regulations; and to provide structurally sound assemblies.

1. Where non-structural metal framing work shown in the Drawings complies with manufacturer's published structural performance (span charts) or standard details, these manufacturer standard documents shall be considered an acceptable substitute for the engineering analysis, calculations and shop drawings described below.

B. Drawings of non-structural metal framing assemblies are diagrammatic and show design intent of finished profiles, shapes, and forms; relationships between elements; location, identification, dimension and size of components, assemblies, and accessories; and details and diagrams of connections.

C. Include engineering analysis by a qualified Engineer, using structural performance requirements and design criteria indicated herein.

D. Determine the size, thickness, and spacing, when not shown on the Drawings, of members, their connections to one another, and anchors to building structure using the following criteria:

1. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure.
2. Performance Requirements: Unless otherwise indicated on the Drawings, engineer assemblies to withstand the loads prescribed by the authorities having jurisdiction, within the specified deflection limits.
   a. Lateral loading:
      1) 5 psf for interior partitions; as prescribed for exterior walls.
      2) 10 psf at elevator shafts, pressurized areas, loading dock areas and where identified in the Drawings; as prescribed for exterior walls.
   b. Limit metal framing systems deflection under load to the following:
      1) L/240 where supporting gypsum board only.
      2) L/360 where supporting tile.
3. Sound Transmission Characteristics: Provide materials and construction as indicated in the assembly, tested in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
   a. Provide assemblies designed and pretested to achieve the minimum ratings as indicated on the Drawings.

E. If required by authorities having jurisdiction, prepare and submit to authorities having jurisdiction: reviewed shop drawings, specifications, load and deflection tables and any other supporting data required by authorities having jurisdiction for their review and approval; and pay fees incurred, prior to beginning installation.

1.3 ACTION SUBMITTALS

A. Product Data: Include a list of proposed products and materials to be provided for complete assemblies, along with manufacturer’s product data, specifications, typical installation details and other data for each material listed to prove compliance with the specified requirements.

B. Shop Drawings: large scale, dimensioned shop drawings for Contractor-engineered assemblies.

1. Show framing member size, thicknesses, number, type, location, and spacing.
2. Indicate component details, framing layout, framed openings, anchorage to structure, bracing, type and location of fasteners and welds, and accessories required for related work.
3. Show metal thicknesses, spacing of members and span dimensions.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Design Data: Submit complete load and deflection tables properly annotated for the indicated framing sizes, spacing, span limits and thicknesses to be used.

B. Certificates:

1. Mill certificates and galvanizing certificates: Signed by framing member/accessory manufacturer certifying compliance with material requirements.

C. Manufacturer's Installation Instructions: Submit manufacturer-prepared instructions concerning the proper preparation and installation framing members and framing accessories.

1.5 QUALITY ASSURANCE

A. Installer's Qualifications: Firm and individuals with a minimum of 3 consecutive years experience in the installation of specified products on projects similar in material, design, complexity and extent to this Project, and whose work has resulted in applications with a record of successful in-service performance.

B. Regulatory Requirements: Where fire-resistive construction is indicated, provide materials, accessories, and application procedures listed by UL, or tested according to ASTM E 119 for the type of construction shown, and approved by the authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Protect materials from excessive moisture in shipment, storage, and handling.

B. Storage: Store off ground, either in a dry, ventilated, enclosed space or protected with suitable waterproof coverings.

C. Handling: Protect metal framing units from rusting and damage.

1.7 SEQUENCING

A. Coordinate placement of concealed internal wall reinforcement, such as backing plates, for items to be attached to metal support systems.

B. Coordinate installation of ceiling and soffit suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorage to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.

C. Furnish concrete inserts, and other devices indicated, to other trades for installation well in advance of time needed for coordination with other construction.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Provide metal framing members from one of the following:

1. MarinoWARE.
2. SCAFCO Corporation.
3. Clarkwestern Dietrich Building Systems LLC.
4. Telling Industries.
5. MBA Metal Framing.

2.2 STUDS, RUNNERS, AND FURRING

A. Framing Members - General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653, G40.

B. Smooth Steel Studs: ASTM C 645, punched web complying with the following:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
3. Uncoated Metal Thickness: Minimum 0.018 inch, refer to the Drawings.

C. Dimpled Steel Studs and Runners:

1. Protective coating: ASTM A 653, G40 galvanized coating.
2. Bracing: Where the wall finish does not adequately brace both flanges of studs, provide bracing or reduce allowable stresses for computing stud heights in compliance with requirements of the authorities having jurisdiction.
3. Uncoated Metal Thickness: Minimum 0.015 inch.

D. Top and Bottom Tracks: As recommended by the manufacturer of each stud type and of the same thicknesses as the studs in same wall or partition, unless otherwise indicated on the Drawings. Provide unpunched, screwable tracks with 1-1/4-inch flanges.

E. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.

2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Slip-Type Head Joints: To accommodate slab deflection where studs extend to the underside of beams, floor or roof slabs, secure at top with a deep leg, minimum 0.063 inch slip connection.

F. Furring Channels: Minimum 0.018 inch thick, galvanized, hat-shaped.

G. Horizontal stiffener, runner channels and bridging: Complying with ASTM A 1003, minimum 0.053 inch metal thick, channels fabricated of cold-rolled steel with flanges not less than 7/16-inch wide. Minimum weights as follows:

Channel Size	Flange Width	Pounds/1000 linear foot
3/4-inch	7/16-inch	300
1-1/2-inch	7/16-inch	475
2-inch	19/32-inch	590

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, minimum 0.062 inch diameter wire, or double strand of minimum 0.048 inch diameter wire.

B. Wire: ASTM A 641, Class 1 zinc coating, soft temper:

1. Hanger Wire: Minimum 0.12 inch diameter, unless otherwise indicated.
2. Diagonal Bracing Wire: 0.08 inch diameter, unless otherwise indicated.
3. Tie wire: 0.05 inch diameter, single-strand annealed steel or 0.04 inch diameter, galvanized, double-strand annealed steel.

C. Metal Channels Supporting Suspended Ceilings (Carrying Channels): Provide metal channels complying with ASTM C 641, galvanized in compliance with ASTM A 924, G60 coating designation, for framing, furring and stiffening, as follows:

Size	Type	Pounds per 1,000 linear feet
3/4 inch	Cold-rolled	300
1 inch	Hot-rolled	410
1-1/2 inches	Hot-rolled	475
2 inches	Cold-rolled	590

D. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum ½ inch wide flanges, 3/4 inch deep.

2. Steel Studs and Runners: ASTM C 645.
   a. Minimum Base-Metal Thickness: minimum 0.033 inch.
   b. Depth: As indicated on Drawings.
3. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
   a. Minimum Base-Metal Thickness: Minimum 0.033 inch thickness>.

E. Direct Hung Suspension System (Alternate Method):

1. Cross Tees: 1-1/2 inch high double web .020 inch thick electro-galvanized steel with 15/16 inch wide capped flange face.
2. Wall Track: 1-1/2 inch to 1-5/8 inch inside dimensions .020 inch thick electro-galvanized steel with 15/16 inch to 1 inch wide top and bottom flange faces.
3. Acceptable Products:
   a. "Drywall Suspension System" (USG Corp.).
   b. "System 640" (Rockwool International).
   c. "Drywall Grid System" (Armstrong World Industries, Inc.).

F. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

2.4 FASTENERS AND ACCESSORIES

A. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates; length and thickness required by Code, or recommended by the metal framing manufacturer when not prescribed by Code.

B. Shot pins: 0.140-inch diameter low velocity powder-actuated drive pins equivalent to Ramset/Red Head No. 1508, or other as approved by Architect, with 7/8-inch minimum penetration into concrete.

C. Anchor bolts: ASTM A 307, non-headed type.

D. Expansion shields: FS FF-S-325, except do not use lead, fiber and plastic shields.

E. For low walls: stud reinforcement "Floor Anchor" (Pinquist Tool & Die Co., Inc.), at every stud.

F. Isolation Strip at Exterior Walls - Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine adjacent construction and supports.

B. Correct conditions detrimental to the proper and timely completion of this work before proceeding with installation.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

C. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

D. Install bracing at terminations in assemblies.

E. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 WALL INSTALLATION

A. General:

1. Erect metal framing systems in compliance with their manufacturer's recommendations, the referenced standards, the Drawings and these Specifications.
2. Use minimum 0.039 inch thick studs at the following locations:
   a. Each side of door openings.
   b. Where studs support backing plates, plumbing fixtures and wall-supported cabinets.
3. Do not attach metal framing to ducts, conduits or pipes. Do not allow metal framing and suspension wires to contact pipes.
4. Cut framing components squarely for a tight fit against abutting members. Erect framing plumb and level to provide solid backing for finish materials. Install steel studs in a wall/partition so that their flanges point in the same direction.
5. Do not exceed a 1/8-inch in 10-foot deviation (non-cumulative) from true lines and levels, nor 1/4-inch from true position. Perform necessary remedial work on framing to achieve specified tolerances.

B. Wall/Partition Framing:

1. Layout partitions and permanently mark on slabs.
2. Align and securely anchor ceiling and floor tracks to building construction. Space anchors within 6 inches of ends of each track segment and at 24 inches o.c. maximum. Do not drive fasteners closer than 2 inches to slab or curb edge.
3. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
4. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
5. Frame openings in stud walls. Provide double studs, closer spacing, and additional reinforcement as detailed or required at doorframes, interior windows and recesses for equipment.
6. Frame both sides of control joints in gypsum board surfaces with separate studs and a discontinuous runner; do not bridge the joint with system components or accessories.
7. Assemble corners using a minimum of 3 studs.
8. Install studs in single length, without joints, extending from floor to underside of floor or roof structure above, except where indicated on the Drawings to stop at or above suspended ceilings. Splicing studs is not permitted without the Architect's approval.
9. Where studs stop at or above suspended ceilings, unless otherwise indicated, brace every fourth stud (maximum) with opposite stud bracing at 45 deg angles securely anchored to the floor or roof above.

10. Attaching studs to runner: Attach studs to tracks by friction fit for single stud gypsum board partitions.
11. Attach the following studs to runner tracks with screws or with a crimping tool in compliance with the stud manufacturer's instructions, except where indicated to be welded.
    a. Studs with gypsum board on only one side.
    b. Studs on each side of doors.
    c. Studs supporting wall hung plumbing fixtures.
    d. Studs supporting wall hung urinal screens, toilet compartments, cabinets and equipment.
    e. Attach corner studs, partition intersections, studs on each side of doorjambs, and other openings in walls/partitions as specified above.
12. Unless otherwise indicated, provide horizontal stiffeners consisting of 3/4-inch channels spaced at not more than 54 inches o.c. maximum in partitions/walls supporting wall supported cabinets. Attach stiffeners to each stud.
    a. Provide an additional 3/4-inch channel 6 inches above door head and extend 2 stud spaces beyond jamb studs.
    b. Install channels in longest possible lengths, lap 12 inches and wire-tie at joints. Do not tie channels on opposite sides of staggered and double stud partitions together.
13. Double studs (face to face to form a tube) at locations adjacent to doors and openings. Extend studs at door openings to slab or deck above and anchor securely to bottom track (as specified in subparagraph 12.b. above) and to top slab or deck with clip angles.
    a. Locate additional studs not more than 2 inches from door and window frames, abutting partitions, partition corners, and other construction.
    b. Install a section of track over door and window frames with a clip angle at each end and attach securely to the adjacent vertical studs.
    c. Install cut-to-length studs at the location of vertical joints and at standard spacing over the doorframe header extending to the ceiling track.
14. Install studs 2 inches away from abutting concrete, steel columns or other structural elements. Extend the horizontal stiffeners and attach it to the structural element.
15. Provide additional framing, as required, for attachment of electrical boxes, fire extinguisher cabinets and similar items located in stud walls.

C. Furring:

1. Provide furring attached to concrete and metal framing to conceal utilities, furred soffits, and other furring as indicated.
2. Furring to receive gypsum board shall be screw-on channels directly attached to backing material, or applied over runner channels as applicable.
3. Furring to receive plaster shall be 3/4-inch cold-rolled channels wire tied to 1-1/2-inch runner channels.
4. Space furring as indicated for studs.

D. Install extra stud, furring members and angle runners at terminations of gypsum board work, and at openings and where required for support of other work occurring in the gypsum board work.

1. Install sheet metal strapping, studs, hat-shaped channels or stud runners in walls where shown on the Drawings or as required by the conditions of the installation, minimum same thickness as stud framing, for the support and attachment of other work. Attach to stud framing with not less than three screws per stud.

E. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

3.5 INSTALLING CEILING & SOFFIT SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Do not attach wires to, or bend around, interfering material such as ductwork, pipes and conduits
   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Do not attach hangers to steel roof deck.
5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

E. Space main runners not over 4 feet O.C. in any dimension so that hanger wires do not support more than 12 square foot of ceiling.

F. Hang suspended framing independent of walls, columns, pipes, ducts, and conduits, and their insulation.

G. Space runner channels not more than 6 inches from parallel walls or beams.

1. Align runner channels accurately relative to indicated ceiling height and saddle-tie with hanger wires.
2. Lap channels 12 inches at splices and tie at each end of lap.

H. Attach furring channels to runner channels at right angles to carrying channels with clips or with 0.05 inch diameter tie wire with triple wrap and triple twist.

1. Space at not over 12 inches O.C. for lath/plaster assemblies, and 16 inches O.C. for gypsum board.
2. Locate approximately 2 inches from parallel walls.
3. Lap channels 12 inches at splices and wire-tie at each end of lap.
4. Assemble and install metal grillage so that it is rigid, square, and free of movement, and level within the tolerances specified.
5. At control joints, provide discontinuous lap in main runners occurring over joints.
    a. Do not bridge joints with cross furring where joints run perpendicular to furring.
    b. Where joints run parallel to furring, provide furring to support each side of joint.

I. Provide recesses and openings where indicated for lighting fixtures, registers, access panels and other items to be installed in ceilings. Provide additional furring channels where required by opening condition.

J. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 INSTALLATION OF DIRECT HUNG CEILING SYSTEM (ALTERNATE METHOD)

A. Install direct hung ceiling (interior) system in accordance with the manufacturer's printed instructions and as specified herein. Comply with ANSI A97.2 and as further specified. Furnish and install hanger devices in coordination with other work.

B. Interconnect main furring runners with furring tees at 24 inches o.c. Install furring tees on all sides around recessed lighting fixtures and other openings in ceiling.

C. Install additional hangers around light fixtures as required to support additional weights of light fixtures. Verify weights of light fixtures prior to installation of suspension system and hangers. Wrap hanger wires tightly at least three full turns.

END OF SECTION

SECTION 09 29 00
GYPSUM BOARD

PART 1 - GENERAL

1.1 SUMMARY

A. Gypsum board, including the following:

1. Interior gypsum board.
2. Gypsum sheathing board.
3. Installation accessories and finishing materials.

B. Related Sections:

1. Cold formed metal framing: Section 05 40 00.
2. Rough carpentry: Section 06 10 00.
3. Building thermal insulation: Section 07 21 00.
4. Fluid applied air barriers: Section 07 27 26.
5. Joint sealants: Section 07 92 00.
6. Hollow metal doors and frames: Section 08 11 13.
7. Non-load bearing metal framing: Section 09 22 16.
8. Painting: Section 09 91 00.

1.2 ACTION SUBMITTALS

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

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Installers of the acoustical gypsum board ceilings.

1.4 QUALITY ASSURANCE

A. Provide gypsum board construction complying with laws, ordinances, rules, regulations, and orders of public authorities having jurisdiction over this part of the Work.

B. Provide primary materials from a single manufacturer unless otherwise approved, in writing by the Architect, to insure total unit responsibility.

C. Installer Qualifications for acoustical gypsum board ceilings: An experienced Installer, approved and trained by product manufacturer to properly install ceiling system.

1. Utilize approved equipment and procedures for proper installation.

D. Gypsum Board:

1. Provide installation of gypsum board materials and systems construction complying with ASTM C 840, the manufacturer's current printed instructions and specifications and Gypsum Association, Standard GA 216 - Recommended Specifications for the Application and Finishing of Gypsum Wall Board, and Standard GA 600 - Fire Resistance Design Manual, current editions, except as herein modified and as approved by the manufacturer.
2. In the event of a conflict between these specifications and the referenced standards, the more stringent or greater is to be utilized for the installation.

E. Sound Transmission Characteristics: Provide materials and construction as indicated in the assembly, tested in accordance with ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. Provide assemblies designed and pretested to achieve the minimum ratings as indicated on the Drawings.

F. Comply with the requirements of the local codes, ordinances, and regulations.

1.5 STORAGE AND HANDLING

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

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and environmentally conditioned.

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

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 ACCEPTABLE GYPSUM BOARD MANUFACTURERS

A. Georgia-Pacific Corp.; Portland, OR 97204.

B. National Gypsum Company, Charlotte, NC 28211.

C. United States Gypsum Co.; Chicago, IL 60680.

D. Certainteed Corporation, Valley Forge, PA 19482.

2.2 GENERAL - PANELS

A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 GYPSUM PANELS

A. Gypsum Board: Complying with ASTM C 1396, regular, Type X or Type C, tapered with beveled or radial edge for finished joints, thickness as shown on the Drawings.

B. Gypsum Ceiling Board: Complying with ASTM C 1396, tapered with beveled or radial edge for finished joints, 1/2 inch thickness, regular and Type X (fire-rated).

C. Gypsum Sheathing Board: Unless noted on the Drawings, or specified otherwise, provide one of the following at the Contractor's option:

1. Paper Faced Gypsum Sheathing: Provide gypsum sheathing board complying with ASTM C 1396 for Type X fire resistant, water resistant, Form (plain back), square edges and ends, 1/2 inch thick, provide one of the following:
   a. "Gold Bond Jumbo or Fire Shield Gypsum Sheathing" (National).
   b. "USG Gypsum Sheathing or Fire Code Type X" (USG).
2. Glass-Mat Faced Gypsum Exterior Sheathing Board: Complying with ASTM C 1177 and ASTM D 3273, regular, 1/2 inch thick, (Type X, 5/8 inch thick where required to be fire-rated), provide one of the following:
   a. "Dens-Glass Gold Exterior Sheathing and Dens-Glass Gold Exterior Fireguard Sheathing" (Georgia-Pacific).
   b. "Glasroc Sheathing" (Certainteed).
   c. "EXP Sheathing and EXP Fire-Shield Sheathing" (National Gypsum).
3. Paperless (No Facing) Gypsum Sheathing Board: Sheathing Board: Complying with ASTM C 1177, ASTM C 1396 and ASTM D 3273, regular, 1/2 inch thick, (Type X, 5/8 inch thick where required to be fire-rated), "Aqua Tough Fiberrock Exterior Sheathing" (USG) or other as approved by Architect.

2.4 TRIM ACCESSORIES

A. Interior Trim: Comply with ASTM C 1047.

1. Material: Paper faced galvanized steel sheet or rigid PVC.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. Control (expansion) joint.

d. Tear-Away Bead: L-Shaped, exposed long flange receives joint compound.

B. Control Joints: Roll formed zinc or extruded vinyl as standard with the board manufacturer.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Board: Paper.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying type, all-purpose compound.
   a. Use setting type compound for installing paper faced metal trim accessories.
3. Fill Coat: For second coat, use drying type, all-purpose compound.
4. Finish Coat: For third, coat, use drying type, all-purpose compound.

D. Sheathing Joint and Penetration Treatment Materials:

1. Sealant for Paper Surfaced and Glass Mat Gypsum Sheathing Board: Silicone emulsion sealant complying with ASTM C 834, compatible with sheathing tape and sheathing, and recommended by tape and sheathing manufacturer for use with fiberglass sheathing tape and for covering exposed fasteners.
2. Sheathing Tape for Glass Mat and Paper Faced Gypsum Sheathing Board: Self-adhering fiberglass tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturer for use with silicone emulsion sealant in sealing joints and penetrations in glass mat gypsum and paper faced sheathing board and with a history of successful in-service use.

2.6 AUXILIARY MATERIALS

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

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

C. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

D. Screws:

1. Metal Studs: Type S and S-12 bugle head and pan head, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
2. Wood Studs: Type W, 1-1/4 inch long or Type S bugle head and pan head, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
3. Gypsum: Type G, sized to suit thickness, zinc plated for exterior use, complying with ASTM C 1002 and ASTM C 954.
4. Gypsum Sheathing: Provide size, type, material, and finish as recommended by gypsum sheathing manufacturer for substrates indicated.
5. Provide fasteners with a hot-dip zinc coating complying with ASTM A 153.
6. Fastening to Metal Studs: Use 1-1/2 inches long, galvanized screws.

E. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire Resistance Rated Assemblies: Comply with mineral fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 PREPARATION

A. When the outside temperature is below 55 deg F, provide heat and maintain in areas where the work is to be performed. Provide heat continuously and uniformly at 55 deg F from one week prior to start of installation until gypsum board application and joint treatment is completed. Do not start installation until windows are glazed and doors installed or openings temporarily closed. Provide ventilation to remove excess moisture during joint treatment.

B. Coordination with Sprayed Fire Resistive Materials: After sprayed fire resistive materials are applied, remove them only to extent necessary for installation of gypsum board assemblies and without reducing the fire resistive material thickness below that which is required to obtain fire resistance.

3.3 INSTALLATION - GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or backing 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, including floors. Provide 1/4 to 1/2 inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound flanking paths

around or through assemblies, including sealing partitions above acoustical ceilings. Separate by 24 inches horizontally outlet boxes and other penetrations on opposite sides of the partition in separate stud cavities and treat with outlet box pads.

J. Install sound attenuation blankets, where shown on the Drawings, pressure fit between studs. Fill voids. Openings and gaps, butt joints of blankets and support and secure in accordance with manufacturer's recommendation when not self-supporting.

3.4 APPLYING INTERIOR GYPSUM BOARD

A. 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 vertically (parallel to framing), unless otherwise indicated or required by fire resistance rated assembly, and minimize end joints.
    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire resistance rated assembly.
3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. 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.
2. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install controls joints in accordance with the following:

1. Install control joints according to ASTM C 840.
2. In specific locations as drawn for visual effect.
3. Where a partition, wall, or ceiling traverses a construction joint (expansion, seismic, or building control element) in the base building structure.
4. Where a wall or partition runs in an uninterrupted straight plane exceeding 30 lineal feet.

5. Interior Ceilings with Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 50 ft and total area between control joints does not exceed 2,500 sq. ft. Install a control joint or intermediate blocking where ceiling framing members change direction.
6. Interior Ceilings without Perimeter Relief: Install control joints so that linear dimensions between control joints does not exceed 30 ft and total area between control joints does not exceed 900 sq. ft. install a control joint or intermediate blocking where ceiling framing members change direction.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. Tear-Away Bead: Use at exposed panel edges.

D. Apply gypsum board screws with an electric driver. Drive screws not less than 3/8 inch from edges or ends of panels to provide a uniform dimple not over 1/32 inch deep.

3.6 INSTALLATION OF EXTERIOR GYPSUM SHEATHING

A. Comply with GA-253 and with manufacturer's written instructions.

B. General: Fasten exterior gypsum sheathing to stud framing for exterior walls. Space fasteners as recommended by gypsum sheathing manufacturer. Keep perimeter fasteners 3/8 inch from edges and ends of board units. Fit boards tightly against each other and around openings.

C. Install sheathing vertically with long edges parallel to and centered over studs. Provide solid framing wherever end joints do not bear against framing sills or plates. Fasten to each support in accordance with manufacturer's recommended spacing, but not more than the following:

1. Space fasteners not more than 4 inches o.c. around perimeter at edge and end supports.
2. Space 8 inches o.c. at intermediate supports.

D. Seal sheathing joints and penetrations in accordance with the sheathing manufacturer's written instructions.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.

3.8 CLEANING AND PROTECTION

A. Take precautions to minimize spattering of joint treatment compounds and other materials on other work. Remove joint treatment compounds promptly from doors, frames, glass and other finishes and surfaces that could be stained or marred by these materials. Clean floors of gypsum board materials and treatment compounds upon completion of the gypsum board work. At completion of work, remove unused materials, scraps, containers and equipment. Remove dust accumulated during finishing operations, leave areas broom clean, ready for painting, wall covering, ceramic tile or other finishes.

B. Provide temporary protection of finish surfaces in areas of high traffic and susceptible to damage from work of others. Maintain protection throughout the construction period so that the work will be without damage or deterioration at the time of Substantial Completion. Repair or replace any damaged work. Remove temporary protection at completion of work or when required for completion of other work.

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

SECTION 09 64 23
PORTABLE WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 SUMMARY

A. Integrated portable sports floor system, including all locking components, softwood sleepers, subfloor sheeting, tongue and groove connectors, hard maple flooring, sanding, sealers, and basic game lines.

B.

C. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Moisture Vapor Emission Control: Section 09 05 61.
3. Preinstallation Testing for Floor Finishes: Section 09 05 65.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Plans, sections, and attachment details.
2. Layout, colors, widths, and dimensions of game lines and markers.

C. Samples:

1. Three 12 inch x 2-1/4 inch pieces of finish flooring using finish specified.
2. Game-line and marker paints.

1.3 INFORMATIONAL SUBMITTALS

A. Product literature and application instructions for floor finish materials.

B. Warranty: Signed copies of warranty in terms specified herein.

1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material and product from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

B. In addition to the requirements specified herein, comply with the recommendations of the Maple Flooring Manufacturer's Association, current applicable publications.

1. Official Flooring Grading Rules, Oak, Pecan, Beech, Birch and Hard Maple (current edition)

C. Grading Marks: Identify all plywood underlayment by official grade mark.

1. Softwood Plywood: Maximum grade trademark of the American Plywood Association.
   a. Type, grade, class and identification index.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver wood flooring materials in unopened cartons or bundles.

B. Protect wood flooring from exposure to moisture. Do not deliver wood flooring until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.

C. Store wood flooring materials in a dry, warm, well ventilated, weathertight location.

D. Move wood flooring into spaces where it will be installed, at least seven (7) days before installation.

1.6 PROJECT CONDITIONS

A. Conditioning: Maintain relative humidity planned for building occupants and an ambient temperature between 65 and 75 deg F in spaces to receive wood flooring for at least 7 days before, during, and after installation. After post installation period, maintain relative humidity and ambient temperature planned for building occupants.

1. Do not install flooring until it adjusts to the relative humidity of and is at the same temperature as the space where it is to be installed.
2. Close spaces to traffic during flooring installation and for time period after installation recommended in writing by flooring and finish manufacturers.

B. Install wood flooring after other finishing operations, including painting, have been completed.

1.7 WARRANTY

A. General Warranty: Special warranty specified in this Article is not to deprive Owner of other rights Owner may have under other provisions of the Contract Documents and is in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Wood Flooring Warranty: Written warranty, signed by manufacturer and installer agreeing to repair or replace wood flooring that fails in materials or workmanship. Failures include, but are not limited to, buckling, cupping, and warping.

1. Provide manufacturer's written warranty in accordance with the General Conditions except the warranty period is to be for ten years instead of one year.

C. This warranty is in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 FLOOR SYSTEMS:

A. Basis of Design: "Quicklock" (Connor Sports Flooring Corporation, Arlington Heights, IL 60005) or equivalent by one of the following manufacturers:

1. Horner Flooring Co., Dollar Bay, MI 49922.
2. Robbins Sports Surfaces, Cincinnati, OH 45244.

2.2 MATERIALS

A. Flooring: 25/32" (20mm) X 2-1/4" (57mm), Second & Better Grade, Northern Hard Maple Flooring, TGEM, MFMA Grade marked and stamped.

B. Floor System Size: Floor system shall measure 60' 5-5/8" X 112' 4" consisting of 233 full panels measuring 48-3/8" x 84-1/4" and 14 half panels measuring 48-3/8" x 42-1/8".

C. Subfloor: Subfloor shall be 7/16" oriented strand board.

D. Sleepers: Double layer nominal 1x4 Fir, Pine or Spruce softwood sleepers.

E. Resilient Pads: 70 durometer, abrasion resistant pads attached per manufacturer. Basis of Design: "Connor PowerShok pads" (Connor Sports.)

F. Panel Connectors
1. Panels shall provide continuous 1/4" (6mm) steel tongues with panel attachment holes provided.
2. Panels shall provide high-density polyethylene tapered grooves to mate with steel tongues of adjacent panels.
3. Pins shall be included for insertion into panel attachment holes as provided in overlapping tongue locations. Inner panel connections shall not be visible after floor system assembly

G. Floor Sanding and Finishing
1. Flooring shall be sanded with coarse, medium, and fine paper to a smooth even and uniform surface.
2. Sanding dust shall be removed from floor surface by tack or vacuum.
3. Floor shall be inspected to insure surface is acceptable for finishing, free from sanding dust, perfectly clean.

4. Two (2) coats of MFMA approved heavy-duty gymnasium seal shall be applied.
5. Two (2) coats of MFMA approved heavy-duty gymnasium finish shall be applied.
6. Floor shall be buffed and cleaned between coats.

H. Game Lines and Marking - Game lines and markings shall be applied between seal and first coat of finish. Paint shall be compatible to gymnasium floor finish. All lines and markings shall be provided as specified by owner. Color of game lines and markings shall match color reference as provided by owner.

I. Storage Carts - Provide storage carts measuring 48” X 84” manufactured of heavy duty steel, including broad based wheels. One cart shall be provided for each row of panels.

PART 1 - EXECUTION

1.1 PROTECTION

A. Throughout job finishing operations, maintain confined and orderly procedures that will avoid detrimental soilage or damage of completed finishes.

B. Protect finished wood flooring from all traffic during the construction period so that it will be without any indication of use or damage at the time of preliminary acceptance by the Owner.

C. Instruct Owner's maintenance personnel in the proper methods and materials to be used in cleaning and maintenance of the wood flooring and its finish.

END OF SECTION

SECTION 09 91 00
PAINTING

PART 1 - GENERAL

1.1 SUMMARY

A. Painting, coatings, and finishing, including the following:

1. Painting and finishing of exterior and interior exposed items and surfaces as specified herein and scheduled and noted on the Drawings.
2. Surface preparation, priming, and coats of paint specified are in addition to shop priming and surface treatment specified in other Sections.
3. Paint as used herein means coating system materials, including primers, emulsions, enamels, sealers, and fillers, and other applied materials whether used as prime, intermediate, or finish coats.
4. Paint exposed surfaces except where the natural finish of the material is obviously intended or specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

B. Related Sections:

1. Cast-in-place concrete: Section 03 30 00.
2. Unit masonry: Section 04 20 00.
3. Structural steel: Section 05 12 00.
4. Steel joists: Section 05 21 00.
5. Steel roof deck: Section 05 30 20.
6. Metal fabrications: Section 05 50 00.
7. Sheet metal flashing and trim: Section 07 62 00.
8. Hollow metal doors and frames: Section 08 11 13.
9. Finish door hardware: Section 08 71 00.
10. Gypsum board: Section 09 29 00.
11. Applicable Sections of Divisions 21, 22 23, and 26.

1.2 PAINTING NOT INCLUDED

A. General: The following categories of work are not included unless otherwise indicated.

1. Shop Priming: Shop priming of ferrous metal items is included elsewhere.
2. Pre-Finished Items: When factory finishing or installer finishing is specified.
3. Concealed Surfaces: Not required on surfaces in concealed areas, inaccessible areas, and duct shafts.
4. Operating Parts and Labels: Moving parts of operating units, mechanical and electrical parts, or code required labels. Embossed metal labels and embossments directly applied to doors and frames may be painted as long as the listing agency mark and listing information is legible.

1.3 DEFINITIONS

A. Flat (matte): Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Eggshell: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Satin: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

D. Semi-Gloss: 35 to 70 units at 60 degrees, according to ASTM D 523.

E. Gloss: 70 to 85 units at 60 degrees, according to ASTM D 523.

F. High Gloss: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for product application and use.
2. Include test data substantiating that products comply with requirements.

B. Samples: Architect's review will be for color and texture only. Provide a listing of the material and application for each coat of each finished sample, include color sample chips from manufacturer.

1. Initial Color Selection: Prior to beginning painting work, Contractor will be furnished sample color chips and copies of Color Schedule for surfaces to be painted. Colors will be selected by the Architect.
2. Draw-Downs: After initial colors have been selected provide actual paint draw-downs for each color and sheen specified, 12 inches by 12 inches.
3. On site Samples: On wall surfaces, ceilings, and other building components of each paint system. On at least 100 sq. ft. of surface as directed, provide full coat finish samples of required sheen, color, and texture. Simulate finished lighting conditions for review of in-place work.

1.5 INFORMATIONAL SUBMITTALS

A. Manufacturer’s Literature: Materials description, installation, and maintenance instructions for each type of paint.

B. Paint Schedule: Submit copies of the paint schedule indicating type of surface to be painted, paint product with generic description, and type of primer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in original, new, and unopened packages and containers bearing manufacturer's name and label.

B. Provide labels on each container with the following information:

1. Name of title of material.
2. Manufacturer's stock number.
3. Manufacturer's name.
4. Contents by volume, for major pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.

C. 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 daily.

1.7 PROJECT CONDITIONS

A. Existing Conditions:

1. Start of painting will constitute the applicator's acceptance of the surfaces and conditions within an area.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to the formation of a durable paint film.

B. Protection:

1. Protect work, whether to be painted or not, against damage by painting and finishing work. Correct damages by cleaning, repairing or replacing and repainting.
2. Provide "Wet Paint" signs as required to protect newly painted finishes. Remove temporary protective wrappings, after completion of painting operations.
3. During the progress of the work, remove from the project daily discarded paint materials, rubbish, cans, and rags.
4. Upon completion of painting work, clean window glass and other paint spattered surface. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

PART 2 - PRODUCTS

2.1 COLORS AND FINISHES

A. Prior to beginning of work, sample color chips for surfaces to be painted will be furnished by the Architect. Match the colors of the chips and submit samples to the Architect as specified herein, before proceeding with the work.

B. Final acceptance of colors will be from samples applied on the job.

C. Proprietary names used to designate colors or materials are not intended to imply that products of the manufacturers are required to the exclusion of equivalent products of other named manufacturers, but the Architect is to be informed in writing of manufacturers and materials used on the job for various colors and finishes.

2.2 PAINT COORDINATION

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturer of topcoat for use in paint system and on substrate indicated.

2.3 CLEANING MATERIALS

A. As recommended in writing by topcoat manufacturer.

2.4 PAINT MATERIALS

A. Provide the best quality grade of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a well known standard, best grade product will not be acceptable.

B. Provide undercoat paint compatible with and produced by the same manufacturer as the finish coats. Use only thinners approved by the paint manufacturer and use only within recommended limits.

C. Provide paint manufactured by one of the following:

1. Behr Process Corporation, Santa Ana, CA 92704.
2. Benjamin Moore (Moore), Montvale, NJ 07645.
3. International, Akzo Nobel N.V., Chicago, IL.
4. PPG Paints, Pittsburgh, PA 15222.

5. Sherwin Williams (S-W), Cleveland, OH 44115.
6. Tnemec Company, Inc., Kansas City, MO 64141.
7. Carboline Company, St. Louis, MO 63144.
8. Master Coatings Technology, Eagan, MN 55121

D. Refer to the Paint Schedule at the end of this Section and building exterior, interior elevations and schedules on the Drawings.

2.5 PATCHING MATERIALS

A. Wood-Patching Compound: Two-part, epoxy-resin, wood-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of wood repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be designed for filling voids in damaged wood materials that have deteriorated from weathering and decay. Compound shall be capable of filling deep holes and spreading to feather edge.

B. Metal-Patching Compound: Two-part, polyester-resin, metal-patching compound; knife-grade formulation as recommended in writing by manufacturer for type of metal repair indicated, tooling time required for the detail of work, and site conditions. Compound shall be produced for filling metal that has deteriorated from corrosion. Filler shall be capable of filling deep holes and spreading to feather edge.

C. Cementitious Patching Compounds: Cementitious patching compounds and repair materials specifically manufactured for filling cementitious substrates and for sanding or tooling prior to repainting; formulation as recommended in writing by manufacturer for type of cementitious substrate indicated, exposure to weather and traffic, the detail of work, and site conditions.

D. Gypsum-Plaster Patching Compound: Finish coat plaster and bonding compound according to ASTM C 842 and manufacturer's written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of painting work. Comply with paint manufacturer's written instructions for inspection.

B. Maximum Moisture Content of Substrates: Do not begin application of coatings unless moisture content of exposed surface is below the maximum value recommended in writing by paint manufacturer:

3.2 SURFACE PREPARATION

A. General:

1. Perform preparation and cleaning procedures in accordance with the topcoat manufacturer's instructions and as herein specified for each condition.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in-place not to be painted or provide surface applied protection prior to surface preparation and painting operations. Remove, if necessary, for the complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, reinstall the removed items by workmen skilled in the trades involved.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program the cleaning and painting so that contaminants from the cleaning process will not fall onto wet newly painted surfaces.

B. Cementitious Materials:

1. Prepare cementitious surfaces to be painted by removing efflorescence, chalk, dust, dirt, grease, and oils. Roughen to remove glaze as necessary.
2. Determine the alkalinity and moisture content of the surface to be painted by performing appropriate tests. If the surfaces are found to be sufficiently alkaline to cause blistering and burning of the topcoat, correct this condition before application of paint. Do not paint over surfaces where the moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood:

1. Clean wood surfaces to be painted of dirt, oil, or other foreign substances. Sandpaper smooth those finished surfaces exposed to view and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of topcoat manufacturer approved sealer, before application of the primer coat. After priming fill holes and imperfections in finish surfaces with wood patching compound. Sandpaper smooth when dried.
2. Prime, stain, or seal wood required to be painted immediately upon delivery to site. Prime edges, ends, face, undersides, and backsides. When transparent finish is required, use spar varnish for back priming.
3. Seal tops and bottoms of wood doors with a heavy coat of varnish or equivalent sealer immediately upon delivery to the job.

D. Ferrous Metals:

1. Clean ferrous surfaces, which are not galvanized or shop coated, of oil, grease, dirt, loose mill scale, and other foreign substances by solvent or mechanical cleaning.
2. Touch up shop applied prime coats required by other Sections of these Specifications. Clean and touch up with the same type shop primer.

E. Galvanized Metal: Clean free of oil and other surface contaminants with a non-petroleum base solvent recommended by paint manufacturer.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's written directions.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage, mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.4 PAINT APPLICATION

A. General:

1. Apply paint in accordance with the manufacturer's directions; use applicators and techniques best suited for the type of material being applied.
2. Apply additional coats when undercoats, stains or other conditions show through the final coat of paint, until the paint film is of uniform finish, color, and appearance.
3. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment of furniture with prime coat only.
4. Paint interior surfaces of ducts, where visible through registers or grilles with a flat, non-specular black paint.
5. Finish exterior doors on tops, bottoms, and side edges same as exterior faces, unless otherwise indicated.
6. Sand lightly between each succeeding enamel or varnish coat.
7. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.
8. Prime surfaces to receive vinyl, fabric, paper wall and other types of wall coverings, unless otherwise indicated.

B. Application Restrictions:

1. Do not apply water base paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 50 deg F, unless otherwise permitted by the paint manufacturer's printed instructions.
2. Do not apply solvent thinned paints when the temperature of surfaces to be painted and the surrounding air temperatures are below 45 deg F, unless otherwise permitted by the paint manufacturer's printed instructions.
3. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or to damp or wet surfaces, unless otherwise permitted by the paint manufacturer's printed instructions. Painting may be continued during inclement weather only if the areas and surfaces to be painted are enclosed and heated within the temperature limits specified by the paint manufacturer during application of drying periods.

C. Minimum Coating Thickness: Provide the manufacturer's recommended minimum coating thicknesses unless herein noted otherwise.

D. Prime Coats:

1. Apply a prime coat to material which is required to be painted or finished and which has not been prime coated by others.
2. Re-coat primed and sealed walls and ceilings where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.
3. Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks or other surface imperfections.

E. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

F. Completed Work: Match reviewed samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.5 PAINT SCHEDULE

A. Interior - New Construction:

1. Exposed Structural Steel:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat: Polyurethane, two-component, pigmented, gloss (<150 g/L VOC):

1) Tnemec: Series 1080 Endurashield.
2) PPG: Amershield VOC polyester Acrylic.
3) Carboline: Carbothane 134 MC.

2. Hollow Metal Doors, and Hollow Metal Frames and Ferrous Metals for Semi-Gloss Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat 2 full coats, acrylic enamel, semi-gloss (<150 g/L VOC):

1) Behr: Direct To Metal Semi-Gloss, 3200.
2) Moore: DTM Acrylic Semi-Gloss HP29.
3) S-W: Pro Industrial Semi-Gloss Acrylic.
4) PPG: Pitt-Glaze WB1 Pre Catalyzed Epoxy Semi-Gloss 16-510.
5) Tnemec: Series 1080 Endurashield.

6) Carboline: Carbocrylic 3359

3. Galvanized-Metal Substrates & Ductwork:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat, 2 coats, Water based enamel (satin) (<150 g/L VOC):

1) Behr: Direct To Metal Semi-Gloss, 3200.
2) Moore: Ultra Spec HP® D.T.M. Acrylic Low Lustre Enamel HP25.
3) PPG: Break Through Water-Borne Acrylic Satin V51-410.
4) S-W: Pro Industrial Acrylic Eg-Shel, B66.
5) Tnemec: Series 115 Uni-Bond DF.
6) Carboline: Sanitile 155.

4. Gypsum Board Walls for Eggshell Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat, 2 coats, -acrylic-latex enamel (eggshell) (<150 g/L VOC):

1) Behr: Behr Pro i300 Interior Eggshell. 330.
2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538.
3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell.
4) S-W: ProMar 200 Zero VOC Interior Latex Eg-Shel, B30 Series.
5) Tnemec: Series 1026 Enduratone.

5. Gypsum Board Ceilings for Flat Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat, 2 coats, Acrylic-Latex (flat) (<50 g/L VOC):

1) Behr: Behr Pro i100 Interior Dead Flat, PR110.
2) Moore: Ultra Spec® 500 Interior Flat Finish N536.
3) PPG: 6-4110XI Speedhide Zero VOC Interior Latex Flat.
4) S-W: ProMar 400 Zero VOC Interior Latex Flat, B30 Series.
5) Tnemec: Series 1026 Enduratone.

6. Gypsum Board Walls for Semi-Gloss Finish:

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat, 2 coats, Acrylic-Latex (Semi-Gloss) (<150 g/L VOC):

1) Behr: BehrPro i300 Interior Semi-Gloss 370.
2) Moore: Eco Spec WB interior Paint Semi-Gloss (N376).
3) S-W: ProMar 200 Zero VOC Interior Latex Semi-Gloss, B30 Series.

4) PPG: 6-4510XI Speedhide Zero VOC Interior Latex Semi-Gloss.
5) Tnemec: Series 1029 Enduratone.

7. Concrete Wall and Ceilings (Dry Environments):

a. Prime Coat: As recommended in writing by topcoat manufacturer (<200 g/L VOC).

b. Topcoat, 2 coats, acrylic-latex enamel (eggshell) (<150 g/L VOC):

1) Behr: Behr Pro i300 Interior Eggshell, 330.
2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538.
3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell.
4) S-W: ProMar 200 Zero VOC Interior Latex Eg-Shel, B30 Series.
5) Tnemec: Series 180 W.B. Tneme-Crete.

8. CMU Substrates Dry Environments:

a. Prime Coat (<200 g/L VOC): As recommended in writing by topcoat manufacturer.

b. Topcoat (<150 g/L VOC), 2 coats, acrylic-latex enamel (eggshell):

1) Behr: Behr Pro i300 Interior Eggshell, 330.
2) Moore: Ultra Spec® 500 Interior Eggshell Finish N538.
3) PPG: 6-4310XI Speedhide Zero VOC Interior Latex Eggshell.
4) S-W: ProMar 200 Zero VOC Interior Latex Eg-Shel, B30 Series.
5) Tnemec: Series 180 W.B. Tneme-Crete.

9. Exposed to View Overhead Construction:

a. Topcoat, 2 coats, Water Based Interior Dry Fog (<150 g/L VOC):
1) Behr: Behr Pro Dryfall Flat, 890 White; 891 Black.
2) Moore: Moore Dry Fall Latex Flat 395.
3) PPG: 6-725XI Speedhide SuperTech WB Flat Dry Fog or 6-724XI Speedhide SuperTech WB Semi Dry Fog-self priming.
4) S-W: Pro Industrial Waterborne Acrylic Dryfall Flat, B42 Series.
5) Tnemec: Series 115 Uni-Bond DF.

3.6 CLEAN UP

A. Just prior to final completion and acceptance, examine painted and finished surfaces and retouch or refinish as necessary.

B. Upon completion of work, remove paint and finishing spots and overspray from floors, glass, and other surfaces. Remove rubbish, containers, and accumulated material of whatever nature not caused by other trades from the project site and leave work in a clean, orderly, and acceptable condition.

END OF SECTION

SECTION 11 66 53
GYMNASIUM DIVIDERS

PART 1 - GENERAL

1.1 SUMMARY

A. **ALTERNATE NO. 4:** Gymnasium dividers including center-drive system, electrical operation, curtains, and accessories.

B. Related Sections:

1. Metal fabrications: Section 05 50 00.
2. Division 26 Sections for electrical service for motor operators, controls, and other powered devices for motorized gymnasium dividers.

1.2 ACTION SUBMITTALS

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

1. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings:

1. Include plans showing alignment of curtains in relation to sport-court layout and overhead structural supports
2. Include elevations, sections, details, and attachments to other work.
3. Include system clearances, stacking requirements, and limits for fitting into adjacent construction.
4. Include point loads and locations for attachment of gymnasium dividers to structure.
5. Include diagrams for power, signal, and control wiring.

C. Samples for Initial Selection: For each type of gymnasium divider curtain fabric indicated.

D. Samples for Verification: For divider curtain fabric, not less than 12 inches square of open mesh.

1.3 INFORMATIONAL SUBMITTALS

A. Structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation including loads, point reactions, and locations for attachment of gymnasium dividers to structure.

B. Coordination Drawings: Reflected ceiling plans with divider-curtain layouts, drawn to scale, on which adjacent and interfering items are shown and coordinated with each other, based on input from installers of the items involved.

C. Product Certificates: For each type of gymnasium divider, signed by product manufacturer.

D. Qualification Data: For: Installer.

E. Operation and Maintenance Data: For gymnasium dividers to include in emergency, operation, and maintenance manuals.

F. Warranty: Special warranty specified in this Section.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

B. Source Limitations: Obtain each type of gymnasium divider from a single manufacturer.

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

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install gymnasium dividers until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Verify position for gymnasium dividers.

1.6 COORDINATION

A. Coordinate installation of overhead-supported gymnasium dividers and suspension system components with other construction including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of gymnasium dividers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, faulty operation of gymnasium dividers.
2. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Extruded Bars, Profiles, and Tubes: ASTM B 221.
2. Cast Aluminum: ASTM B 179.
3. Flat Sheet: ASTM B 209.

B. Steel: Comply with the following:

1. Steel Plates, Shapes, and Bars: ASTM A 36.
2. Steel Tubing: ASTM A 500 or ASTM A 513, cold formed.
3. Steel Sheet: ASTM A 1011.

C. Anchors, Fasteners, Fittings and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed; tamperproof, vandal- and theft-resistant design.

2.2 CENTER-DRIVE DIVIDER SYSTEMS

A. Divider-Curtain System: Electrically operated, with center-drive tube rolling the upper and lower sections of the curtain simultaneously; and as follows:

1. Adjustable pipe hanger assembly.
2. Roll Tube: Anodized, extruded-aluminum tubing.

B. Basis-of-Design Product: Subject to compliance with requirements, provide "No. 92082 Center-Roll Gymnasium Divider Curtain", with "Power Touch 2.5" "Sportsonic II Dual-Mode Radio Control/Key Switch System" (Porter Athletic) or a comparable product by one of the following:

1. Draper Inc.
2. Performance Sports Systems.

2.3 ELECTRIC OPERATORS

A. Provide factory-assembled electric operation system of size and capacity recommended in writing and provided by gymnasium divider manufacturer for gymnasium dividers specified, with electric motors and factory-prewired motor controls, control devices, and accessories required for proper operation.

1. Include wiring from control stations to motors and between synchronizer and dual motors for long curtains. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

B. Electrical Components, Devices, and Accessories: Listed and labeled according to NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Limit Switches: Adjustable switches at each divider curtain, interlocked with motor controls and set to automatically stop divider curtain at fully extended and fully retracted positions.

D. Control System:

1. Key-Switch Operation: NEMA ICS 6, Type 1 enclosure, momentary-contact, three-position switch-operated control with up, down, and off functions.

a. Group Key-Switch Control: One switch per each curtain.
b. Switches, Ganged: Single faceplate with multiple switch cutouts as indicated on Drawings.
c. Keys: Provide two keys per station.

2.4 DIVIDER CURTAINS

A. Divider Curtains: Electrically operated, roll up, and as follows:

1. Upper Curtain, Mesh: Woven fabric of 100 percent polyester yarn coated with PVC weighing not less than 7 oz./sq. yd .

a. Mesh Color: White.

2. Lower Curtain, Solid: Woven polyester coated with vinyl, 18 oz./sq. yd, embossed, half curtain height above floor.

a. Fabric Color: As selected by Architect from manufacturer's full range for one color.

3. Divider Curtain Flame-Resistance Ratings: Passes NFPA 701, inherently and permanently flame resistant.

a. Permanently attach label to each fabric of curtain assembly indicating whether fabric is inherently and permanently flame resistant or treated with flame-retardant chemicals, and whether it will require retreatment after designated time period or cleaning.

B. Curtain Fabrication: Fused seams and the following:

1. Top Hem: Reinforce with double thickness mesh for continuous pipe batten.
2. Bottom Hem for Roll-up Curtains: Floor-length curtains with hems 2 inches above finished floor and with manufacturer's standard 3-1/2- to 4-inch- roll-up tube and lifting tape.

C. Accessories:
1. Curtain Battens: Fabricate battens from extruded aluminum tube with a minimum number of joints. As necessary for required lengths, connect tubes with drive-fit sleeve not less than 18 inches long, and secure with 4 flush rivets,

threaded couplings, or another equally secure method. Shop-paint completed pipe battens that are exposed to view with white paint. Center roll batten shall be standard natural aluminum finish.

2. Inertia Safety Brake mechanism to prevent Divider Curtain from accidentally falling during the raising or lowering cycle or while in storage position.
3. Audible Motion Alarm: Provide alarm with intermittent warning tone when curtain is raised or lowered.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance.

1. Verify critical dimensions.
2. Examine supporting structure.
3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements have been clearly marked. Locate reinforcements and mark locations.
4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Comply with manufacturer's written installation instructions. Complete field assembly, where required.

B. Unless otherwise indicated, install gymnasium dividers after other finishing operations, including painting, have been completed.

C. Install Gymnasium Dividers level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.

1. Verify clearances for movable components of gymnasium dividers throughout entire range of operation and for access to operating components.

D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary for securing gymnasium dividers to structural support and for properly transferring load to in-place construction.

E. Electric Operators Installation: Connect electric operators to building electrical system.

3.3 ADJUSTING

A. Adjust movable components of gymnasium dividers to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

B. Limit Switch Adjustment: Set and adjust upper and lower limit controls.

3.4 CLEANING

A. After completing gymnasium divider installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.

B. Replace gymnasium divider components and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

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

END OF SECTION

SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Concrete foundations and footings.
2. Structural-steel framing.
3. Metal roof panels.
4. Metal wall panels.
5. Metal soffit panels.
6. Thermal insulation.
7. Personnel doors and frames.
8. Windows.
9. Accessories.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in standards referenced by this Section.

1.4 PERFORMANCE REQUIREMENTS (DESIGN CRITERIA)

A. Delegated Design: The design, structural and environmental engineering of the metal building systems including accessories and anchors to the foundations are the responsibility of the Manufacturer/Fabricator. Design metal building systems and associated components of the installation to conform to the design criteria stated herein.

B. Provide factory built, prefabricated metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

1. Wind Loads: As indicated in the Drawings.
2. Snow Loads: As indicated in the Drawings.

C. Thermal Movements: Provide factory built, prefabricated metal building systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. UL and NEMA Compliance: Provide internal electrical components required as part of metal building systems that are listed and labeled by UL and comply with applicable NEMA standards.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-rod inserts into foundation walls and footings. Anchor rod installation, concrete, reinforcement, and formwork requirements are specified in Section 033000 "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.6 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

    a. Foundations and other preparatory work.
    b. Structural load limitations.
    c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
    d. Required tests, inspections, and certifications.
    e. Unfavorable weather and forecasted weather conditions and impact on construction schedule.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

    a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
    b. Structural limitations of purlins and rafters during and after roofing.
    c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.

d. Temporary protection requirements for metal roof panel assembly during and after installation.
e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
b. Structural limitations of girts and columns during and after wall panel installation.
c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
d. Temporary protection requirements for metal wall panel assembly during and after installation.
e. Wall observation and repair after metal wall panel installation.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

a. Metal roof panels.
b. Metal wall panels.
c. Thermal insulation and vapor-retarder facings.
d. Personnel doors and frames.
e. Windows.
f. Roof ventilators.

B. Shop Drawings: Indicate components by others. Include full building plan, elevations, sections, details and the following:

1. Submit shop drawings of concrete reinforcing.
   a. Initial submittal of reinforcement shop drawings shall be complete. No partial submittals will be accepted.
   b. Indicate reinforcement size, spacing, locations and quantities of reinforcing steel and wire reinforcement, bending and cutting schedules, splicing, supporting, and spacing devices.
   c. Reinforcement placement shop drawings for foundations and wall shall conform to ACI SP-66 providing full wall elevations.
2. Material Certificates: For each of the following, signed by the manufactures:
   a. Cementitious materials.
   b. Admixtures.
   c. Curing compounds.
   d. Bonding agents.
   e. Vapor retarders.
3. Mix Design: Submit proposed concrete mix design of each class of concrete to Engineer not later than 10 days after Notice to Proceed or 15 days prior to the first concrete placement, whichever comes first.

a. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
b. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
c. Test Reports: Submit report for each test or series of tests specified.
    1) Provide test mix results for all concrete for structural slabs, beams, walls, and columns. Must include ASTM C1202 and C157.
    2) Aggregates.
d. Maturity Meters:
    1) Manufacturer.
    2) Proposed locations.
e. Manufacturer's Installation Instructions: For concrete accessories, indicate installation procedures and interface required with adjacent construction.

4. Anchor-Rod Plans: Submit anchor-rod plans and templates before foundation work begins. Include location, diameter, and minimum required projection of anchor rods required to attach metal building to foundation. Indicate column reactions at each location.
5. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
6. Metal Roof and Wall Panel Layout Drawings: Show layouts of panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, clip spacing, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.
    a. Show roof-mounted items including roof hatches, equipment supports, pipe supports and penetrations, lighting fixtures, and items mounted on roof curbs.
    b. Show wall-mounted items including personnel doors, vehicular doors, windows, louvers, and lighting fixtures.
7. Accessory Drawings: Include details of the following items:
    a. Flashing and trim.
    b. Gutters.
    c. Downspouts.
    d. Service walkways.

C. Samples for Initial Selection: For units with factory-applied finishes.

D. Door Schedule: For doors and frames. Use same designations indicated on Drawings. Include details of reinforcement.

1. Door Hardware Schedule: Include details of fabrication and assembly of door hardware. Organize schedule into door hardware sets indicating complete designations of every item required for each door or opening.
2. Keying Schedule: Detail Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations.

1.8 INFORMATIONAL SUBMITTALS

A. Delegated-Design Submittal: For metal building systems.

1. Include analysis data indicating compliance with performance requirements and design data signed and sealed by the qualified professional engineer responsible for their preparation.

B. Qualification Data: For erector, manufacturer and land surveyor.

C. Welding certificates.

D. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

1. Name and location of Project.
2. Order number.
3. Name of manufacturer.
4. Name of Contractor.
5. Building dimensions including width, length, height, and roof slope.
6. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
7. Governing building code and year of edition.
8. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
9. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
10. Building-Use Category: Indicate category of building use and its effect on load importance factors.

E. Erector Certificates: For qualified erector, from manufacturer.

F. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

G. Source quality-control reports.

H. Field quality-control reports.

I. Surveys: Show final elevations and locations of major members. Indicate discrepancies between actual installation and the Contract Documents. Have surveyor who performed surveys certify their accuracy.

J. Sample Warranties: For special warranties.

1.9 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes and door hardware to include in maintenance manuals.

1.10 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer.

1. Accreditation: Manufacturer's facility accredited according to the International Accreditation Service's AC472, "Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems."
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

D. Land Surveyor Qualifications: A professional land surveyor who practices in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect foam-plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
2. Protect against ignition at all times. Do not deliver foam-plastic insulation materials to Project site before installation time.

3. Complete installation and concealment of foam-plastic materials as rapidly as possible in each area of construction.

1.12 FIELD CONDITIONS

A. Weather Limitations: Proceed with panel installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

1.13 WARRANTY

A. Special Warranty on Metal Panel Finishes: Manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roof Panels: Manufacturer agrees to repair or replace standing-seam metal roof panel assemblies that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Buildings Company; a Nucor Company.
2. Butler Manufacturing Company; a division of BlueScope Buildings North America, Inc.
3. Nucor Building Systems.
4. Tyler Building Systems, L.P.
5. Vulcan Steel Structures, Inc.

B. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

A. Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

B. Primary-Frame Type:

1. Rigid Clear Span: Solid-member, structural-framing system without interior columns.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and flush-framed girts.

E. Eave Height: As indicated by nominal height on Drawings.

F. Bay Spacing: As indicated on Drawings.

G. Roof Slope: As indicated on Drawings.

2.3 STRUCTURAL-STEEL FRAMING

A. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings."

B. Bolted Connections: Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts."

C. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

D. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafters, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.

2. Rigid Clear-Span Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Interior columns are not permitted.
3. Frame Configuration: Single gable.
4. Exterior Column: Tapered.
5. Rafter: Tapered.

E. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

F. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, prepainted with coil coating, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; minimum 2-1/2-inch- wide flanges.

a. Depth: As needed to comply with system performance requirements.

2. Purlins: Steel joists of depths indicated on Drawings.
3. Girts: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 40 to 50 degrees from flange, with minimum 2-1/2-inch- wide flanges.

a. Depth: As required to comply with system performance requirements.

4. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
5. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch- diameter, cold-formed structural tubing to stiffen primary-frame flanges.
6. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
7. Base or Sill Angles: Manufacturer's standard base angle, minimum 3-by-2-inch, fabricated from zinc-coated (galvanized) steel sheet.
8. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.

9. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
10. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

G. Bracing: Provide adjustable wind bracing using any method that follows:

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
2. Cable: ASTM A 475, minimum 1/4-inch- diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.
3. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
4. Rigid Portal Frames: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
5. Fixed-Base Columns: Fabricated from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
6. Diaphragm Action of Metal Panels: Design metal building to resist wind forces through diaphragm action of metal panels.

H. Anchor Rods: Headed anchor rods as indicated in Anchor Rod Plan for attachment of metal building to foundation.

I. Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS) or High-Strength Low-Alloy Steel with Improved Formability (HSLAS-F), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or HSLAS, Grades 45 through 70.
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G60 coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, SS, Grades 33 through 80, or HSLAS or HSLAS-F, Grades 50 through 80; with G90 coating designation.
b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, SS, Grade 50 or 80; with Class AZ50 coating.

9. Joist Girders: Manufactured according to "Standard Specifications for Joist Girders," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for primary framing.
10. Steel Joists: Manufactured according to "Standard Specifications for Open Web Steel Joists, K-Series," in SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders"; with steel-angle, top- and bottom-chord members, and end- and top-chord arrangements as indicated on Drawings and required for secondary framing.
11. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.

    a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.

12. High-Strength Bolts, Nuts, and Washers: ASTM F 3125/F 3125M,Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1, hardened carbon-steel washers.

    a. Finish: Hot-dip zinc coating, ASTM F 2329, Class C.
13. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 3125/F 3125M, Grade F1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436/F 436M, Type 1 hardened carbon-steel washers.

    a. Finish: Mechanically deposited zinc coating, ASTM B 695, Class 50.

J. Finish: Factory primed. Apply specified primer immediately after cleaning and pretreating.

1. Clean and prepare in accordance with SSPC-SP2.
2. Coat with manufacturer's standard primer. Apply primer to primary and secondary framing to a minimum dry film thickness of 1 mil.

    a. Prime secondary framing formed from uncoated steel sheet to a minimum dry film thickness of 0.5 mil on each side.

2.4 METAL ROOF PANELS

A. Basis of Design: "MR-24" (Butler Manufacturing).
1. Roof System Design:

a. Design roof panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
b. Design roof paneling system for a minimum roof slope of 1/4 inch in 12 inches.
c. Design roof paneling system to support design live, snow, and wind loads.
d. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.

2. Roof System Performance Testing:
   a. UL Wind Uplift Classification Rating, UL 580: Class 90.
   b. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.
   c. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 07 61 13.
   d. FM Global (Factory Mutual):
      1) Roof system has been tested in accordance with FMRC Standard 4471 and approved as a Class 1 Panel Roof.
      2) Metal Building System Manufacturer: Provide specific assemblies to meet required wind rating in accordance with FM Global.
      3) Installation modifications or substitutions can invalidate FM Global approval.
3. Roof Panels:
   a. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
   b. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
   c. Variable Width Panels:
      1) For roof lengths not evenly divisible by the 2'-0" panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
      2) Minimum Length: 15 feet.
      3) Supply maximum possible panel lengths.
   d. Panel Material and Finish:
      1) 24-gauge steel coated both sides with layer of acrylic-coated Galvalume aluminum- zinc alloy (approximately 55 percent aluminum, 45 percent zinc) applied by continuous hot-dip method.

2.5 METAL WALL PANELS

A. Basis of Design: "Butlerib II" (Butler Manufacturing.)
1. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
2. Wall Panels:
   a. Roll-formed panels, 3 feet wide with 4 major corrugations, 1-1/2 inches high, 12 inches on center, with 2 minor corrugations between each of the major corrugations entire length of panel.
   b. One piece from base to building eave.

c. Upper End of Panels: Fabricate with mitered cut to match corrugations of "Butlerib® II" roof panels of 1/2 inch to 12 inches and square cut for all other roof panels and slopes.
d. Factory punch or field drill wall panels at panel ends and match factory-punched or field- drilled holes in structural members for proper alignment.
e. Panel Material and Finish:
1) Paint with exterior colors of "Butler-CoteTM" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.

3. Fasteners:
a. Wall Panel-to-Structural Connections: Torx-head "ScruboltTM" fasteners.
b. Wall Panel-to-Panel Connections: Torx-head self-drilling screws.
c. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
d. Exposed Fasteners: Factory painted to match wall color.

4. Accessories:
a. Accessories (i.e., doors, windows, louvers): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
b. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.

2.6 THERMAL INSULATION

A. Faced Metal Building Insulation: ASTM C 991, Type II, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch- wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

B. Unfaced Metal Building Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch- wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

C. Mineral-Fiber-Blanket Insulation: ASTM C 665, type indicated below; consisting of fibers manufactured from glass, slag wool, or rock wool.

1. Nonreflective Faced: Type II (blankets with nonreflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
2. Reflective Faced: Type III (blankets with reflective membrane covering), Category 1 (membrane is a vapor retarder), Class A (membrane-faced surface with a flame-spread index of 25 or less).
3. Unfaced: Type I (blankets without membrane covering), passing ASTM E 136 for combustion characteristics.

D. Faced, Polyisocyanurate Board Insulation: ASTM C 1289, Type I (foil facing), Class 2, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, based on tests performed on unfaced core. Provide units tested for interior exposure without an approved thermal barrier.

E. Retainer Strips: For securing insulation between supports, 0.025-inch nominal-thickness, formed, metallic-coated steel or PVC retainer clips colored to match insulation facing.

F. Abuse Resistant Vapor-Retarder Facing:
1. Basis of Design: "GymGuard" (Lamtec) or approved equivalent designed to protect insulation from ball impact.
2. ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96/E 96M, Desiccant Method.
3. Mullen Burst: 250 psi
4. Composition: 0.0015 inch white metallized polypropylene film laminated to a fiberglass/polyester blend fabric with a fire resistant adhesive.

G. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

2.7 ABUSE RESISTANT FACING

A. Basis of Design: "GymGuard" (Lamtec) or approved equivalent designed to protect insulation from ball impact.

2.8 PERSONNEL DOORS AND FRAMES

A. Swinging Personnel Doors and Frames: Metal building system manufacturer's standard doors and frames; prepared and reinforced at strike and at hinges to receive factory- and field-applied hardware according to BHMA A156 Series.

1. Steel Doors: 1-3/4 inches thick; fabricated from metallic-coated steel face sheets, 0.036-inch nominal uncoated steel thickness, of seamless, hollow-metal construction; with 0.060-inch nominal uncoated steel thickness, inverted metallic-coated steel channels welded to face sheets at top and bottom of door.

a. Design: As indicated on Drawings.
b. Core: Polyurethane foam with U-factor rating of at least 0.07 Btu/sq. ft. x h x deg F.
c. Glazing Frames: Steel frames to receive field-installed glass.
d. Glazing: Manufacturer's standard.

2. Steel Frames: Fabricate 2-inch- wide face frames from zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.060-inch nominal uncoated steel thickness.

a. Type: Factory welded.

3. Fabricate concealed stiffeners, reinforcement, edge channels, and moldings from either cold- or hot-rolled steel sheet.
4. Hardware:

a. Provide hardware for each door leaf, as follows:

1) Hinges: BHMA A156.1. Three antifriction-bearing, standard-weight, full-mortise, stainless-steel or bronze, template-type hinges; 4-1/2 by 4-1/2 inches, with nonremovable pin.
2) Lockset: BHMA A156.2. Mortise, with lever handle type.
3) Exit Device: BHMA A156.3. Touch- or push-bar type.
4) Threshold: BHMA A156.21. Extruded aluminum.
5) Silencers: Pneumatic rubber; three silencers on strike jambs of single door frames and two silencers on heads of double door frames.
6) Closer: BHMA A156.4. Surface-applied, standard-duty hydraulic type.
7) Weather Stripping: Vinyl applied to head and jambs, with vinyl sweep at sill.

b. Provide each pair of double doors with the following hardware in addition to that specified for each leaf:

1) Astragal: Removable type.
2) Surface Bolts: Top and bottom of inactive door.

5. Anchors and Accessories: Manufacturer's standard units, galvanized according to ASTM A 123/A 123M.
6. Fabrication: Fabricate doors and frames to be rigid; neat in appearance; and free from defects, warp, or buckle. Provide continuous welds on exposed joints; grind, dress, and make welds smooth, flush, and invisible.

B. Materials:

1. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.
2. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, CS, Type B; free of scale, pitting, or surface defects; pickled and oiled.
3. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, CS, Type B; with G60 zinc (galvanized) or A60 zinc-iron-alloy (galvannealed) coating designation.

C. Finishes for Personnel Doors and Frames:

1. Factory-Applied Paint Finish: Manufacturer's standard, complying with SDI A250.3 for performance and acceptance criteria.

a. Color and Gloss: As selected by Architect from manufacturer's full range.

2.9 WINDOWS

A. Aluminum Windows: Metal building system manufacturer's standard, with self-flashing mounting fins, and as follows:

1. Type, Performance Class, and Performance Grade: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 and as follows:
a. Fixed Units: FW-CW30.

2. Aluminum Extrusions: ASTM B 221, alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish, but not less than 0.064-inch thickness at any location for main frame and sash members.

    a. Thermally Improved Construction: Fabricate window units 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.

3. Mullions: Between adjacent windows, fabricated of extruded aluminum matching finish of window units.
4. Fasteners, Anchors, and Clips: Nonmagnetic stainless steel, aluminum, or other noncorrosive material, compatible with aluminum window members, trim, hardware, anchors, and other components of window units. Fasteners shall not be exposed, except for attaching hardware.

    a. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.128 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, spline grommet nuts.

5. Hardware: Manufacturer's standard; of aluminum, stainless steel, die-cast steel, malleable iron, or bronze; including the following:

    a. Cam-action sweep sash lock and keeper at meeting rails.
    b. Spring-loaded, snap-type lock at jambs.
    c. Pole-operated, cam-action locking device on meeting rail where rail is more than 72 inches above floor.
    d. Lift handles for single-hung units.
    e. Nylon sash rollers for horizontal-sliding units.
    f. Steel or bronze operating arms.

6. Sliding-Type Weather Stripping: Woven-pile weather stripping of wool, polypropylene, or nylon pile and resin-impregnated backing fabric; complying with AAMA 701/702.

B. Glazing:

1. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear), 3 mm thick.
2. Heat-Treated Float Glass: ASTM C 1048, Type I, Quality-Q3, Class I (clear), Condition A, 3 mm thick.
3. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of 2.5-mm-thick clear float glass separated by a dehydrated interspace, qualified according to ASTM E 2190.
4. Safety Glass: Category II materials complying with testing requirements in 16 CFR 1201.

    a. Provide safety glazing labeling.

5. Glazing Stops: Screw-applied or snap-on glazing stops coordinated with glazing system indicated. Match material and finish of window frames.

6. Factory-Glazed Fabrication: Glaze window units in the factory to greatest extent possible and practical for applications indicated. Comply with requirements in Section 088000 "Glazing."

C. Finish:
1. Baked-Enamel Finish, Organic Coating: Thermosetting, modified-acrylic enamel primer/topcoat system complying with AAMA 2603 except with a minimum dry film thickness of 0.7 mil, medium gloss.

a. Color: As selected by Architect from manufacturer's full range.

2.10 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

1. Form exposed sheet metal accessories that are without excessive oil-canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from stainless-steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from stainless-steel sheet or nylon-coated aluminum sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch- thick, flexible closure strips; cut or premolded to match metal wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers.
2. Opening Trim: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.030-inch nominal uncoated steel thickness, prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Roof Ventilators: Gravity type, complete with hardware, flashing, closures, and fittings.

1. Continuous or Sectional-Ridge Type: Factory-engineered and -fabricated, continuous unit; Zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet, 0.018-inch nominal uncoated steel thickness, prepainted with coil coating; finished to match metal roof panels. Fabricated in minimum 10-foot- long sections. Provide throat size and total length indicated, complete with side baffles, ventilator assembly, end caps, splice plates, and reinforcing diaphragms.

    a. Bird Screening: Galvanized steel, 1/2-inch- square mesh, 0.041-inch wire; or aluminum, 1/2-inch- square mesh, 0.063-inch wire.

b. Dampers: Manually operated, spring-loaded, vertically rising type; chain and worm gear operator; with pull chain of length required to reach within 36 inches of floor.
c. Throat Size: as standard with manufacturer, and as required to comply with ventilation requirements.

H. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.
   a. Fasteners for Metal Roof Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM washer under heads of fasteners bearing on weather side of metal panels.
   b. Fasteners for Metal Wall Panels: Self-drilling, Type 410 stainless steel or self-tapping, Type 304 stainless-steel or zinc-alloy-steel hex washer head, with EPDM sealing washers bearing on weather side of metal panels.
   c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
   d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.
2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
3. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
4. Metal Panel Sealants:
   a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
   b. Joint Sealant: ASTM C 920; one part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.11 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.

2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.
3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing if applicable, or punch for bolts.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll forming or break forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

2.12 SOURCE QUALITY CONTROL

A. Special Inspection: Owner will engage a qualified special inspector to perform source quality control inspections and to submit reports.

1. Accredited Manufacturers: Special inspections will not be required if fabrication is performed by an IAS AC472-accredited manufacturer approved by authorities having jurisdiction to perform such Work without special inspection.

a. After fabrication, submit copy of certificate of compliance to authorities having jurisdiction, certifying that Work was performed according to Contract requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written instructions and drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base and Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
3. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt type and joint type specified.

    a. Joint Type: Snug tightened or pretensioned as required by manufacturer.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Steel Joists: Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Standard Specifications and Load Tables for Steel Joists and Joist Girders," joist manufacturer's written instructions, and requirements in this Section.

1. Before installation, splice joists delivered to Project site in more than one piece.
2. Space, adjust, and align joists accurately in location before permanently fastening.
3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.

4. Joist Installation: Bolt joists to supporting steel framework using carbon-steel bolts unless otherwise indicated.
5. Joist Installation: Bolt joists to supporting steel framework using high-strength structural bolts unless otherwise indicated. Comply with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for high-strength structural bolt installation and tightening requirements.
6. Joist Installation: Weld joist seats to supporting steel framework.
7. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

I. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod and cable bracing to avoid sag.
2. Locate interior end-bay bracing only where indicated.

J. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

K. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.

C. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

D. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

E. Lap-Seam Metal Panels: Install screw fasteners using power tools with controlled torque adjusted to compress EPDM washers tightly without damage to washers, screw threads, or metal panels. Install screws in predrilled holes.

1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Lap ribbed or fluted sheets one full rib corrugation. Apply metal panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.

F. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

G. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

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

1. Install clips to supports with self-drilling or self-tapping fasteners.
2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
4. Seamed Joint: Crimp standing seams with manufacturer-approved motorized seamer tool so that clip, metal roof panel, and factory-applied sealant are completely engaged.
5. Rigidly fasten eave end of metal roof panels and allow ridge end free movement for thermal expansion and contraction. Predrill panels for fasteners.
6. Provide metal closures at peaks, rake edges, rake walls and each side of ridge caps.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels within installed tolerance of 1/4 inch in 20 feet on slope and location lines and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. When two rows of metal panels are required, lap panels 4 inches minimum.
4. When building height requires two rows of metal panels at gable ends, align lap of gable panels over metal wall panels at eave height.
5. Rigidly fasten base end of metal wall panels and allow eave end free movement for thermal expansion and contraction. Predrill panels.
6. Flash and seal metal wall panels with weather closures at eaves and rakes, and at perimeter of all openings. Fasten with self-tapping screws.
7. Install screw fasteners in predrilled holes.
8. Install flashing and trim as metal wall panel work proceeds.
9. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated on Drawings; if not indicated, as necessary for waterproofing.
10. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
11. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, noncumulative; level, plumb, and on location lines; and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.
3. Install factory-laminated, vapor-retarder-faced blankets straight and true in one-piece lengths, with both sets of facing tabs sealed, to provide a complete vapor retarder.
4. Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation, with both sets of facing tabs sealed, to provide a complete vapor retarder.

B. Blanket Roof Insulation: Comply with the following installation method:
1. Between-Purlin Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Hold in place with bands and crossbands below insulation.

2. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.8 DOOR AND FRAME INSTALLATION

A. General: Install doors and frames plumb, rigid, properly aligned, and securely fastened in place according to manufacturers' written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for metal wall panels.

B. Personnel Doors and Frames: Install doors and frames according to NAAMM-HMMA 840. Fit non-fire-rated doors accurately in their respective frames, with the following clearances:

1. Between Doors and Frames at Jambs and Head: 1/8 inch.
2. Between Edges of Pairs of Doors: 1/8 inch.
3. At Door Sills with Threshold: 3/8 inch.
4. At Door Sills without Threshold: 3/4 inch.

C. Sliding Service Doors: Bolt support angles to opening head members through factory-punched holes. Bolt door tracks to support angles at maximum 24 inches o.c. Set doors and operating equipment with necessary hardware, jamb and head mold stops, continuous hood flashing, anchors, inserts, hangers, and equipment supports.

D. Field Glazing: Comply with installation requirements in Section 088000 "Glazing."

E. Door Hardware:

1. Install surface-mounted items after finishes have been completed at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
2. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
4. Set thresholds for exterior doors in full bed of sealant complying with requirements for concealed mastics specified in Section 079200 "Joint Sealants."

3.9 WINDOW INSTALLATION

A. General: Install windows plumb, rigid, properly aligned, without warp or rack of frames or sash, and securely fasten in place according to manufacturer's written instructions. Coordinate installation with wall flashings and other components. Seal perimeter of each window frame with elastomeric sealant used for metal wall panels.

1. Separate dissimilar materials from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in AAMA/WDMA/CSA 101/I.S.2/A440.

B. Set sill members in bed of sealant or with gaskets, for weathertight construction.

C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

D. Mount screens directly to frames with tapped screw clips.

3.10 ACCESSORY INSTALLATION

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

1. Install components required for a complete metal roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.

2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without excessive oil-canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
1. Tie downspouts to underground drainage system indicated.

E. Continuous Roof Ventilators: Set ventilators complete with necessary hardware, anchors, dampers, weather guards, rain caps, and equipment supports. Join sections with splice plates and end-cap skirt assemblies where required to achieve indicated length. Install preformed filler strips at base to seal ventilator to metal roof panels.

F. Roof Curbs: Install curbs at locations indicated on Drawings. Install flashing around bases where they meet metal roof panels.

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform field quality control special inspections and to submit reports.

B. Product will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.12 ADJUSTING

A. Doors: After completing installation, test and adjust doors to operate easily, free of warp, twist, or distortion.

B. Door Hardware: Adjust and check each operating item of door hardware and each door to ensure proper operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

C. Windows: Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and at weather stripping to ensure smooth operation and weathertight closure. Lubricate hardware and moving parts.

D. Roof Ventilators: After completing installation, including work by other trades, lubricate, test, and adjust units to operate easily, free of warp, twist, or distortion as needed to provide fully functioning units.

1. Adjust louver blades to be weathertight when in closed position.

3.13 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780/A 780M and manufacturer's written instructions.

B. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

C. Touchup Painting: After erection, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted structural framing, bearing plates, and accessories.

1. Clean and prepare surfaces by SSPC-SP 2, "Hand Tool Cleaning," or by SSPC-SP 3, "Power Tool Cleaning."
2. Apply a compatible primer of same type as shop primer used on adjacent surfaces.

D. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

E. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean

finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

F. Doors and Frames: Immediately after installation, sand rusted or damaged areas of prime coat until smooth and apply touchup of compatible air-drying primer.

1. Immediately before final inspection, remove protective wrappings from doors and frames.

G. Windows: Clean metal surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances. Clean factory-glazed glass immediately after installing windows.

END OF SECTION